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Highlands Electricity

Industrial Possibilities of New Scheme

LITTLE time has been lost in embodying in a Parliamentary Bill the main recommendations of the Cooper Committee which recently reported on hydro-electric development in North Scotland. The magnitude of the proposals, which were summarised by us last week, may be gauged from the authority given to the Treasury to guarantee the principal of and interest on loans raised by the Hydro-Electric Board up to £30 million. This sum is nearly as much as that originally allowed under a similar guarantee for the construction of the grid. It is to be hoped that there will be no more need for the new guarantee to be implemented than there has been in the case of the Central Electricity Board.

Insufficient Local Demand

Primary consideration is to be given to the electrical needs of the inhabitants of the Highlands. Electricity from water-power can be cheap if generated on a reasonably large scale and if the continuous output can be absorbed, but these conditions would not be met by any probable local demands. Prospects would be greatly improved by attracting to the neighbourhood chemical and metallurgical industries working at high load factors and requiring exceptionally large amounts of electric power at lower kWh rates than could be supplied from steam stations. The fact that such processes employ very much less labour per kWh than do more ordinary industries simplifies the housing problem.

A further requisite, especially in early years, is a market for the large output in excess of local needs. This market is available in the grid and the profits anticipated in the Cooper Report from the bulk sale of surplus energy would be available for developing the Board's area. Incidentally, the Bill makes provision for any additional profits made by existing undertakings as a result of the Board's operations to be handed on to consumers.

Earlier Schemes as Basis

Presumably the nucleus of the scheme will be the Caledonian and Glen Affric stations which were projected in earlier abortive Private Bills. The combined output of these stations was stated in the I.E.E. presidential address of Professor C. L. Fortescue to be enough to avoid the burning of 400,000 tons of coal per annum in steam stations. In present circumstances a saving of this order may outweigh previous objections to the schemes. The most serious of these arose from a desire to conserve the scenery of the glens. That this can remain unimpaired is shown, as Professor Fortescue has pointed out, by many hydro-electric stations in Switzerland and Sweden. It will fall to the Amenity Committee, which is to be set up, to exercise a proper vigilance.

As to the large number of smaller falls which it will be the duty of the Board to harness, the overall cost per kWh may often be unduly high unless a low rate of interest can be arranged, since capital charges very largely determine the total

operating cost of hydro-electric as contrasted with steam stations. This handicap is exaggerated (more particularly in the initial stages of operation) by a more onerous system of local rating for the former. Effect has not been given in the Bill to the recommendations of the Cooper Report on this point, but the issue might well be raised during Committee stage. No doubt many other amendments will then be proposed, but the point of most importance is that the Board shall be left to function untrammelled by political considerations.

Red Cross Appeal

WE mentioned last week that the last public act of the late Lord Hirst was his appeal as chairman of the Electrical Industries Red Cross Fund. It has been suggested that it would be a fitting tribute to the memory of the great electrical leader if there were a very generous response to his appeal. So far the Fund is going well. Deeds of covenant have been signed by a prominent electrical manufacturing concern (£2,000), a London electricity supply company (£500), a firm of engineers (£500), a cable manufacturing company (£250), a radio manufacturer (£200), and many others. There have also been many generous donations including £1,000 from a power company. The lists indicate that all sections are represented and the prospects that the electrical industries will make as good a showing as others may be regarded as excellent.

Allied Electricals

NOT the least of the hardships of electrical engineers of allied nations now in this country is to be deprived of the contact with their fellow professionals that is facilitated by a technical association. In order to compensate for this loss as far as possible and to enable these men to keep abreast of developments, the Institution of Electrical Engineers has extended the arrangement already made with the Society of Polish Electrical Engineers to the corresponding associations of all the allies and also to non-members if serving with the Forces. They will be welcomed at all meetings and in the libraries of the I.E.E., whether in London or the Provinces. I.E.E. members will do a good turn to these exiles by making the invitation widely known.

A Generation Section

WITH increasing specialisation comes the need to cater in greater detail for electrical engineers with differentiated technical interests; hence the four sections of the Institution of Electrical Engineers. In suggesting the addition of a Generation Section, Mr. T. H. Carr voices a wish that is prevalent among the many power station members. These Sections are not inexpensive to run and cause an appreciable amount of extra work on an already taxed headquarters staff. Nevertheless, the possibility of forming a new Section should be considered since, in spite of the great importance of generating problems, including combustion, at the present time, there are few opportunities for discussing them in practical vein.

Transformer Overloads

THE query that has been raised as to whether, in the present emergency, transformers should be operated on loads so much in excess of their ratings that the expected life would be reduced to a figure only enough to tide over the next few years instead of the normal twenty years is discussed by Mr. E. T. Norris in this issue. The proposal as stated would appear to be impracticable, apart from the reliability aspect, as a number of unpredictable variables are involved. The safe thermal loading should, nevertheless, be exploited to the full by ascertaining the margin of capacity still available under any loading conditions. Suitable instruments are available from several manufacturers.

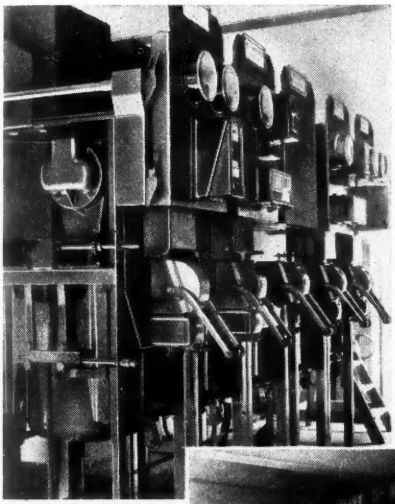
The Future Cooker

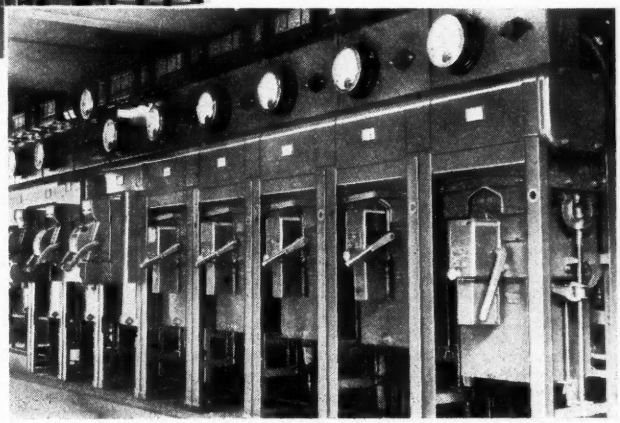
AN advertisement in *The Times* last week gave indication of the anxiety of electric cooker manufacturers to secure new ideas in the matter of design. A wide appeal was made to " free-lance or spare-time designers, artists or engineers " for designs of an "acceptable character for the future." The wise proviso that those replying should have a knowledge of the industry was inserted. Too many designs which we have seen have had little regard to production possibilities. The manufacturers' name was not completely revealed, nor was it hidden, for to members of the industry the address " Broad Green Hall, near Liverpool " was sufficient indication of the origin of the advertisement.

Factory Distribution

Special Safety Provisions

THE factory to which this article refers is notable mainly on account of its buildings being spread over a very large area for safety reasons bearing on the handling of explosives, and this aspect of wide separation is reflected right through the distribution scheme to be described. Indeed, because of this vital principle of separation and for other reasons such as special regulations which govern the distances of cables from many process buildings, the design of the electricity distribution scheme is quite out of step with the generally accepted economics of distribution.





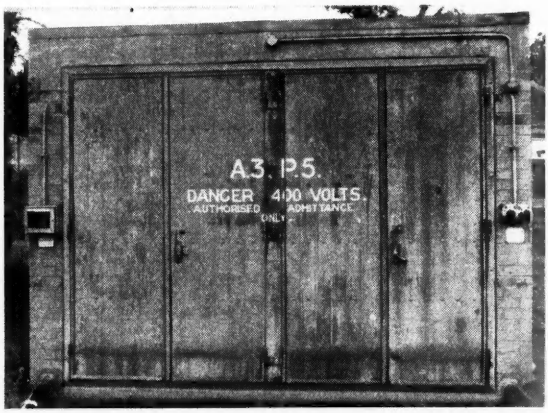
Above : Each 11-kV substation board has incoming transformer, busbar coupler and outgoing transformer panels
Right : The busbar coupler panel on the substation low-voltage board carries a multi-point voltage selector switch for rapid checking

Where normally there would probably have been one large ring main for the primary distribution at 11 kV, there are a number of smaller ring mains employing p.i., l.c., s.w.a. cables laid direct in the ground. Each of the several substations on each ring main is a brick and concrete structure with fireproof doors. As with the cables, the substations have had to be erected beyond specified distances from certain buildings, and in consequence the substation sites do not in all cases represent the load centres of the factory. All the same, it is surprising how near to the load centres it has been possible in many cases to place the " subs " after meeting the safety requirements, as the result of good planning. Each substation measures about 30 ft. by 30 ft. by 12 ft. high, and is divided into a switching room which houses both the high-voltage and low-voltage equipments, disposed as two facing switchboards, and two transformer chambers.

The 11-kV board is of the Crompton Parkinson metalclad compound-filled type with five circuit-breaker units arranged from end to end as follows : incoming, transformer, bus-bar coupler, transformer and outgoing. Each circuit-breaker has carrying and rupturing capacities of 300 A and 25,000 kVA, respectively. " Translay " protection is provided for the ring-main switchgear throughout. Each of the circuit-breaker units is equipped with an ammeter, while each of the two ring-main panels has, in addition, a voltmeter. The transformer panels are provided with over-current and earth-leakage protection on the h.v. side and also integrating watt-hour instruments

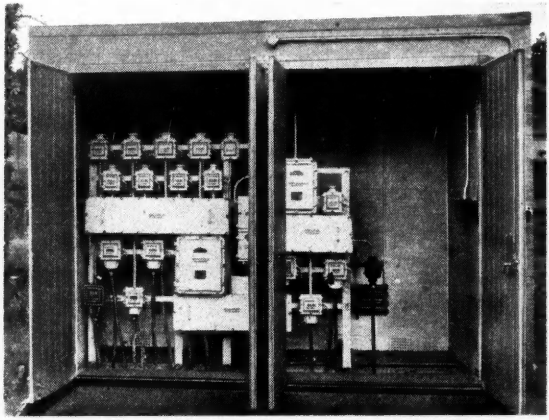
for metering, at 11 kV, three-phase, the supplies to the factory.

For convenience let us complete the description of the switchgear instead of following the installation in the order of supply. The low-voltage switchboard is built up of a number of "Klad" circuit-breaker units to serve the 400-V, three-phase, four-wire secondary distribution scheme, the carrying capacities of the circuit-breakers ranging from 300 A to 600 A. The rupturing capacity in each case is 25,000 kVA. The number of panels varies according to the service demanded from the substations, but ten may be a good average. Two of them are incoming transformer control panels and with the exception of a central busbar section switch the remainder of the panels all serve outgoing factory feeders.



Without entering the switch pillar normal supplies can be cut off in emergency and essential lighting controlled; note code marking

Each feeder panel and l.v. transformer panel is equipped with adjustable overload inverse time-limit relays and adjustable earth-leakage relays which are sufficiently sensitive to ensure rapid disconnection in the event of an earth fault on any cable, together with an ammeter and a four-point (three-phase and neutral) ammeter selector switch. The busbar coupler panel carries a multi-point voltage selector switch and voltmeter, an arrangement which provides for the rapid checking of voltage between any two phases and between any phase and neutral on either section of the board. Relay tripping is provided for by a nickel-cadmium battery which is trickle charged. Both the high-voltage and low-voltage switchboards are mounted above pebble-filled cable trenches for oil absorption. An important auxiliary service in the switch-room is afforded by a tubular-heater scheme with thermostatic control to maintain the room temperature above that of dewpoint and thus minimise condensation. Automatic telephones in the substations are part of the factory intercommunication system.



The dust-proof and flash-proof pillar equipment is assembled on a fabricated angle-iron frame

The two 11-kV/400-V transformers, one in each chamber, vary in capacity from about 500 to 800 kVA, according to the demands on the substations. They are of British Electric Transformer Co. manufacture and arranged for off-load tap changing. They are delta h.v. and star l.v. connected.

There are pebble-filled soak-away pits at the base of each transformer, and each chamber is served by a "Foamite" CO_2 fire protection system. This embraces a glass cartridge fuse at ceiling level which automatically operates in the event of an abnormal rise of temperature, thereby opening a retaining

circuit on the gas cylinders and hence allowing the gas to be ejected out into the chamber.

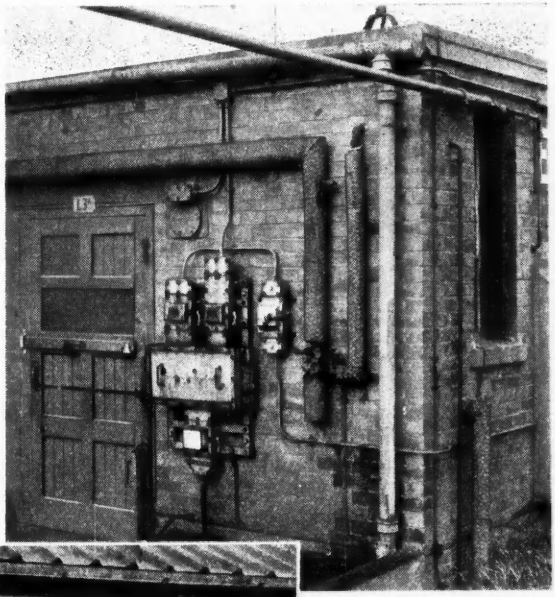
An effective safeguard against failure of operation of this system and conditions which would not permit entry into the chamber is the provision for tripping the controls of the system by means of pull-lever mechanism mounted upon the exterior of the substation.

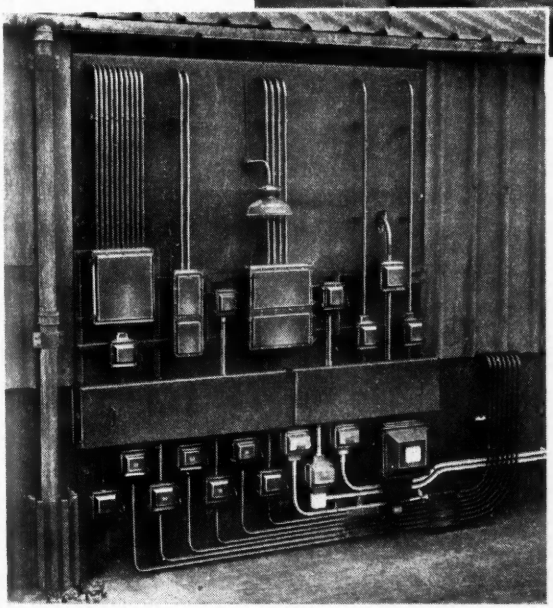
Earthing Points

To ensure the maximum sensitivity on the earth-leakage systems with high-resistance soil conditions there are two external earthing points to each substation. Each consists of a brick pit in which is buried vertically in coke and earth a six-inch water pipe in three sections with flanges faced and bonded. At the top of the pit is a water spray by means of which the coke and soil are kept saturated in dry weather.

The principle of separation is again evidenced in the low-voltage cabling from the substations, for whereas normally one might have expected 400-V ring mains to and from each substation and low-voltage interconnectors between the substations, we have instead "leg" distributors operating independently, one radiating from each low-voltage circuit-breaker in the substation direct to a pillar or switching chamber. Except that they are smaller and single-chamber structures, these chambers are of similar construction to the substation buildings. The switchgear in each chamber is assembled on a fabricated angle-iron framework.

The incoming feeder from the substation terminates at what is known as the 24-hour busbar, so that there is a busbar section in the chamber directly controlled from the feeder circuit-breaker in the substation. Certain services such as emergency lighting and power

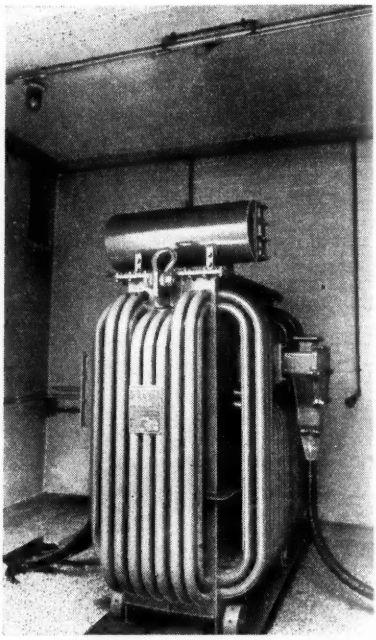




Flameproof equipment proper is used for dangerous buildings
Normal building distribution equipment is mounted on an outside wall

supplies for which the maximum continuity of supply is essential under practically all conditions and circumstances are fed from this 24-hour busbar through contactors which can be controlled by push-buttons outside the chamber. For the normal factory supplies there is another busbar which is fed from the 24-hour unit *via* a contactor which can also be operated by push-buttons outside the chamber. Thus, without entering the chamber, the normal factory supplies can be disconnected in the case of emergency and certain essential services can be switched on and off at all times independently of the normal supply.

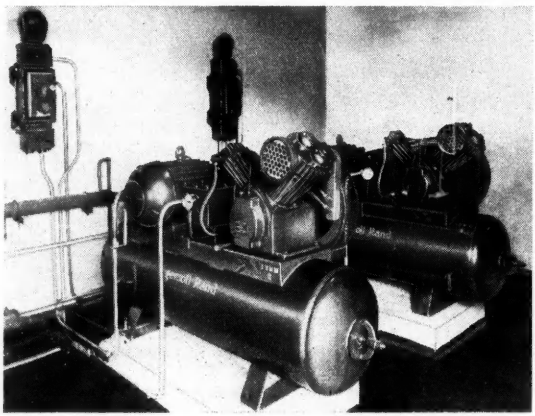
During factory " silent " periods all the normal supply cables are isolated at the source. The normal supply contactor and the special lighting contactor are of the " latched in " type. The normal supply circuits are independently controlled by dust-proof and flash-proof switch-fuses by Parmiter, Hope & Sugden. The contactors are Brookhirst air-break units in sheet-steel cabinets. Each feeder chamber has an exterior pilot light to indicate tripping of the normal supply. In certain cases where the load in one building is comparable to that normally taken by a switch chamber the feeder from the substation is taken direct to the building where there is a leg distribution switchgear scheme similar to that in a switch chamber. In other cases sub-chambers are fed from the primary chambers so as to meet the requirements of more straggling distributions in parts of the factory where the loading is " thinner."



Each transformer chamber is served by a CO_2 fire protection system

In order to provide a ready means of identification for tracing the supply circuits from their sources up to the distribution chambers there is in vogue a simple yet ingenious system of coding for the main equipments. Each ring main has its own identification mark (number or letters) and that mark is carried progressively by all the major equipments fed from that particular ring. Further, each substation on that ring has its own identification mark which it carries with the mark of the ring, the symbols being read from left to right.

Similarly, each switch chamber fed from one substation has its own particular identification mark which it also carries with the substation and ring-main marks, reading progressively left to right. The scheme is carried on right through the equipment, so that on the ultimate sub-circuit there are identification marks of the source of supply and the various distribution stages. This scheme is not only essential to the principle of segregation, but is also of considerable



The only switchgear inside explosives buildings is flame-proof; motor driven compressors

assistance in normal electrical operations.

Each building, other than those few fed directly from the substations, has its independent twin or four-core service cable direct from one of the chambers to the building distribution switchgear which is assembled on a fabricated angle-iron frame on the building wall outside. A typical building distribution assembly is a main isolator, a busbar unit, and power and lighting distribution switchboards, the equipment being generally of the same type as that employed in the distribution chambers. The exceptions are where flameproof gear proper is used for obvious reasons. From the building distribution boards to the factory equipment the supply is by means of v.i.r. cables in solid-drawn screwed galvanised conduit with specially designed flash-proof fittings (Simplex, Walsall and G.E.C.) without through holes and with the covers fixed by means of hexagon-headed screws, all the metal-to-metal joints having machined faces.

All the conduit in the buildings is spaced half an inch from the walls to preclude the collection and lodgement of explosive dust. All normal switches are placed outside the building, with the exception of emergency stops, and the only switchgear inside explosives buildings is flameproof. In particularly dangerous buildings switching is effected remotely and mechanically by means of Renold chain equipment.

Electric Mail-vans

New Fleet to Replace Petrol Vehicles

THE General Post Office has often been accused of not taking advantage of the eminently suitable characteristics of the electric vehicle for its local collection and delivery work. In Germany no fewer than 27,000 vehicles of this type are employed for postal duties. It is therefore gratifying to learn that, as a result of experiments which have been carried out over a long period, delivery has recently been made to the G.P.O. of nine " Metrovick " battery vehicles for general duties in the Manchester district.

The fleet of electric vehicles just put into service by the G.P.O.

The service has hitherto been operated by petrol-driven vans with 105 cu. ft. of load space. The standard " Metrovick " 10/14-cwt. chassis has been modified where necessary to suit the body requirements, which, contrary to the usual demand, required a shortening of the longitudinal chassis members at the rear. The vehicles are designed for a payload of 8 cwt. in addition to a crew of two, and are capable of covering 42 miles per charge with full-rated battery capacity and an average payload of 4 cwt. (and crew of two) in a reasonably level district with eight stops per mile. A speed of 20 MPH is attained on the level and 8 MPH up a gradient of 1 in 10. The vans are intended for a service involving a scheduled daily mileage of 30 for six days per week. Women drivers are employed.

The vehicle is driven by a series-wound totally enclosed traction-type motor centrally mounted between the frame members. Special " Class B " heat-resisting insulation combined with ample conducting surfaces provides a high overload capacity. A relay incorporated in the field coils lights a lamp on the instrument panel when the motor temperature becomes unduly high. This

provision is made for exploring possibilities of heavier duties rather than as an anticipation of overheating in normal service.

The drum-type controller is operated by a foot pedal combined with a change-over switch with hand lever for forward or reverse running. It connects the battery halves successively in parallel and in series, thereby giving two economical running speeds and keeping resistance losses to a minimum. One full depression of the pedal takes the controller through two resistance stages to the half-speed position with the batteries connected in parallel. By allowing the pedal to return about three-quarters of its stroke and depressing again to the full extent progress continues through two resistance stages with battery sections in series to the full-speed position. These six steps with continuous torque transmission enable smooth and rapid acceleration to be obtained under all conditions, the economic half-speed being very useful for working in fog or dense traffic.

While the drum makes the required changes to the connections, all making and breaking of circuits is carried out by a cam-operated contactor provided with a magnetic blow-out. The forward-reverse switch is so interlocked with the controller that the lever cannot be moved from neutral unless the controller is in the "off" position, and the controller cannot be moved until the charging plug is removed from the socket. Furthermore, if the foot brake is applied when the controller pedal is depressed an interlock causes the controller to return to the "off" position, thus preventing "stalling" of the motor.

The battery consists of 40 cells of the lead-acid type with a rated discharge capacity of about 235 Ah at the 5-hr. rate. It is mounted in two sections in boxes suspended between the wheels, with good accessibility. The batteries were supplied severally by the Chloride Electrical Storage Co., Ltd., the D.P. Battery Co., Ltd., and the Young Accumulator Co., Ltd.

The chassis frame is of all-welded box section rigidly braced by transverse members carrying the batteries and equipment. The bodywork consists of ash framing and steel-faced plywood panels built on ordinary electric vehicle lines but designed with short overall length to conform with G.P.O. practice. Advantage was taken in the body design of the opportunity to introduce electric vehicle methods of light yet robust construction, without omitting any essential features of the standard G.P.O. design.

Nine battery-charging equipments supplied, each of sufficient capacity to charge a fully-discharged battery in nine hours, are of the Westinghouse metallic rectifier type designed to operate from three-phase mains. An important feature of each set is the "MJV" relay which switches off the equipment automatically when charging is complete.

Our acknowledgments are due to the Postmaster-General for permission to publish this article and also to the Metropolitan-Vickers Electrical Co., Ltd., for supplying the necessary information.

Compressed-Gas Cables

Glass Rings Centralise Stranded Core in Copper Tube

ENGINEERS the world over will give deserved praise to the attempt to advance interest in compressed gases for insulating purposes by Mr. H. Metcalf Hobart, in the *Journal* of the Franklin Institute.

The 47 pages cannot be conveniently condensed, but to whet the appetite of interested engineers mention is made of his proposed design for a three-phase, 345,000-V transmission circuit consisting of a tubular copper conductor of 0·526 sq. in. section and of 1·75 in. diameter bore (into which supplementary stranded conductor can be placed) held concentrically by tough glass rings at intervals in a 0·375 in. thick insulating tubular barrier which has glass rings to keep it concentric in an enclosing pipe of 5·5 in. internal and 6·5 in. outside diameters.

The voltage-stress at the surface of the 2 in. diameter conductor is shown to be 280 crest volts per thousandth of an inch.

Stresses of this magnitude are already applied in service to paper insulated cables which are oil filled under 15 to 26 lb. per sq. in. pressure, with excellent results; the highest voltage for the oil-filled system, so far in service, being 220,000.

It is believed that this compressed gas system for the transmission of large power over great distances will cost less than overhead transmission lines of equal reliability and much less than any underground high-voltage cable system at present available. It will be immune from lightning if used throughout.

If applied to extend existing overhead lines the compressed gas system will have features which can assure adequate surge attenuation before the arrival of the lightning transient wave at the step-down compressed-gas-transformer, which may also be situated underground, providing a system that is free from the vulnerability and conspicuousness of overhead lines.

Mr. Hobart has exhaustively searched technical literature and gives credit to authors and publications for all researches into the subject and has convinced himself that compressed gas will ultimately be widely employed and will afford great economies and operating advantages.

His paper includes graphs of temperature-pressure vaporisation for carbon tetrachloride, sulphur dioxide, freon and carbon dioxide and crest voltage breakdown strengths for various spacings and compressions up to 50 absolute atmospheres for air as well as nitrogen and carbon dioxide gases.—T.T.B.

Loading of Transformers

Safe Conditions for Wartime Economy Operation

By E. T. Norris,
M.I.E.E., Fellow Amer.I.E.E.

THE maximum safe load a transformer will carry is a function of the amounts of copper, steel and other materials used in its construction. It is, therefore, particularly desirable at the present time that the loading capacity shall be utilised as fully as possible. The ordinary demands of efficient operation are thus greatly accentuated and considerations which in peacetime were economically desirable are now of vital importance.

In practice, the safe load is usually limited by the maximum temperature which the insulating materials will withstand continuously. When the hottest spot in the insulation reaches this temperature limit, the transformer is carrying its maximum safe load. The hottest spot temperature generally occurs at some internal point in the winding, and is thus the true basis of the calculation and measurement of the safe thermal rating.

In these days it is essential to utilise the loading capacity of transformers to the fullest extent. The author advocates that safe-load indicators should be standard fittings on transformers of 200-kVA and over

For the present purpose this limiting temperature H, may be expressed in the following relation : $H=T+G+A$, where T=temperature rise of hottest oil, G= temperature rise of windings over oil, usually termed the winding gradient, and A= ambient air temperature.

Now T and G are dependent in different degrees upon the load and upon its duration or variation with time and A is an independent variable*. The limiting temperature can thus be reached in a very large number of different ways. The maximum safe load has not therefore a single value for a given transformer, but a wide range of values determined by the inter-relation of these variables ; *i.e.*, by the particular operating conditions. On the other hand, a single standard rating is necessary for reference and comparison purposes.

Standard Rating

In most cases, in order that the standard rating may be conservative, the conditions chosen are most severe and such as very seldom occur in practice, and the standard rating is then identical with the maximum safe rating only when the external operating conditions and the relation between the hottest-spot temperature and the temperatures T and G are the same in the two cases. This condition very rarely occurs. For example, the B.S.S. oil-immersed self-cooled rating is based on continuous loading and a maximum air temperature of 40 deg. C. It is very seldom in practice that a transformer is carrying full load continuously. It is also very seldom that the ambient-air temperature is 40 deg. C. The combination of both these conditions is still more rare. It is doubtful whether a case exists in practice of a transformer operating at its B.S.S. rating, *i.e.*, on full load continuously and with a maximum ambient-air temperature of 40 deg. C.

This position is recognised in both British and American Standard Specifications. In the British Transformer Specification (B.S.S. 171–1936) tables give the overload capacity or maximum safe rating for certain specified

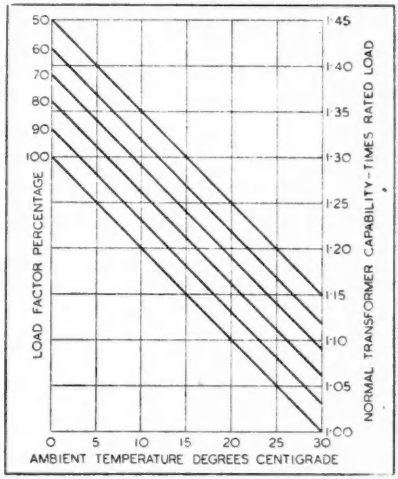


Fig. 1.—American standard overload chart

durations of a single load or vice versa. These tables take into account the individual thermal time constant of the transformer and for the simple conditions considered are reliable and accurate. The American standards give similar information in their " Guides for Operation " (American Standard C-57 Section 2000). More general information (of lower accuracy through ignoring variations in individual transformer characteristics) showing the effect of ambient temperature

* " Safe Loading of Oil-immersed Transformers," *Trans. A.I.E.E.*, October, 1929.

and of load duration expressed as load factor has recently been officially published (*Electrical Engineering*, September, 1942, p. 692). A typical chart of this type is reproduced in fig. 1.

It has been suggested that in order to assist production at the present time transformer ratings might be increased under emergency conditions beyond the limits set by safe hottest-spot temperatures at the expense of reducing the life-expectancy of the insulation (see *Electrical Review*, August 15th, 1941, p. 78). The American reference just quoted gives overload information on this basis for short-time operation assuming not more than 25 or 30 emergencies in the normal life of the transformer and allowing for a total life reduction of about 25 per cent. due to excessive heating of the insulation.

It does not seem that these concessions will be of great practical value, since they permit too infrequent application for normal operation overloads, while it is impossible to predetermine abnormal emergency conditions and usually impracticable to prescribe or de-limit them. In general, when they occur, the transformer must take its chance in the vital struggle to maintain the supply. Moreover, running transformer insulation well above the temperature at which progressive damage occurs will appreciably increase the risk of breakdown. It is doubtful whether the increased loading capacity thus obtained will justify this liability in wartime.

The broad indications of safe loading published in the foregoing references should, of course, be utilised to the fullest extent, but experience in general has shown that they are disappointingly limited in practical application. In the first place the load magnitude, its variation with time or effective load factor and the associated

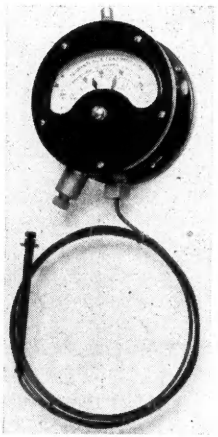


Fig. 2.—Safe-load indicator for large transformers

variations in ambient-air temperature can seldom be predetermined and even actual values (especially under war time conditions) are often only conjectured due partly to progressive and seasonal changes. Secondly, these values even when known form a complex combination which is unlikely to correspond with the simple conditions assumed in the standard loading tables and charts. It is necessary, if the full transformer capacity is to be utilised, to be able to measure and record the true safe loading of a transformer when actually in service, and to be of practical value this must be done cheaply and accurately.

Since there is no direct connection between the hottest-spot temperature, and the hottest-oil temperature, measurement of the latter is not in itself an indication of the load that the transformer will safely carry. A thermometer recording the temperature of the hottest oil of a transformer in service is therefore of no real value as a safe-load indicator. A transformer on load having a hottest-oil temperature of 80 deg. C., for example, may have a hottest-spot temperature of anything up to 150 deg. C. or more, depending on the thermal design and loading conditions.

Instruments are available, known as "winding temperature indicators," which record the hottest-spot temperature by measuring directly the hottest-oil temperature and adding to it the winding gradient G obtained indirectly through its relation to the load current in the transformer windings.

The bulb of a dial-type thermometer is immersed in the hottest oil of the transformer. A small heating coil connected to the secondary winding of a current transformer and carrying a current proportional to the load current is wound round the bulb and is so designed that it increases the temperature of the bulb by an amount equal to the winding gradient G. The temperature of the bulb will then be the same as the hottest-spot temperature of the transformer windings. These instruments are well established as a reliable protective device against overloading and are a standard fitting on transformers for the Central Electricity Board and other large users.

When the hottest-spot temperature of a transformer in service reaches the maximum safe value, the transformer is fully loaded. At any temperature below this limit the transformer is correspondingly underloaded. The relation between the percentage safe load on the transformer and the hottest-spot temperature is not, however, constant, but depends on the loading conditions, the thermal characteristics of the transformer and on the temperature of the cooling medium. Suppose, for example, that the hottest-spot temperature of a transformer at a given instant is 90 deg. C. whilst the maximum safe value is 110 deg. C. The transformer is not fully loaded, but the unused capacity cannot be determined from these two temperatures alone and may be any value between 10 and 30 per cent., depending upon the thermal design of the transformer

and the temperature of the cooling medium. The indicators described show, therefore, whether or not the transformer is fully loaded, but they do not show what proportion or percentage of its maximum safe load the transformer is actually carrying. This latter information is of great use if the true thermal rating of the transformer is to be fully utilised.

In the safe-load indicator* the hottest-spot temperature is obtained indirectly on the same principle as the instruments previously described, but the instrument is calibrated in terms of maximum safe load. The actual load a transformer is capable of carrying at any instant is not a definite function of the cooling-medium temperature and the transformer thermal characteristics, but depends also on the previous loading history of the transformer.

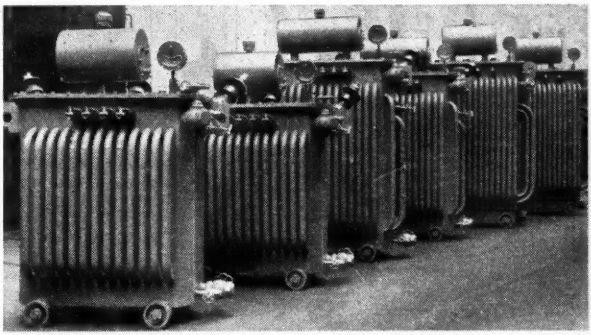


Fig. 3.—Group of distribution transformers fitted with safe-load indicators

It will thus be seen that the safe-load indicator does not necessarily record the actual load on the transformer at any instant in terms of the maximum safe load but the thermal resultant of all the preceding loading conditions that have had any influence on the thermal state of the transformer at that instant.

A reading of 70 on the instrument would then mean, for instance, that the actual load on the transformer under the existing operating conditions was 70 per cent. of the load the transformer could safely carry under the same conditions.

The safe-load indicator shows, therefore, while the transformer is in service, the margin of safe loading still available, and thus gives directly and accurately information otherwise involving the complex calculations referred to earlier in this article. The spare capacity thus indicated saves increases or extensions until absolutely necessary, and is also useful information in planning new installations of similar type. The few pounds of material involved in the indicator may well reveal the availability of tons of copper and steel of spare transformer capacity or, alternatively, show that similar savings can safely be made in new extensions or replacements.

It is suggested that the safe-load indicator should be prescribed as a standard fitting on all transformers of 200 kVA rating and over. If this is done and combined with full use of the standard overload tables and charts and of accurate calculations in those cases where the loading conditions are more definitely known, the most efficient use can be made of transformer copper, steel and other materials both in existing and new installations.

* "Thermal Rating of Transformers," *I.E.E. Journal*, August, 1928.

Chilean Power Plans

Sauzal Scheme Inaugurated

A YEAR or so ago Mr. Guillermo Moore, chief of the engineering department of fuel and power, Corporación de Fomento de la Production, Chile, visited Canada to study hydro-electric works there in view of his company's plans to undertake extensive development of this kind in Chile. He then stated that five plants were to be established with an aggregate capacity of 300,000 HP. Work was begun towards the end of 1941 on the Sauzal project at Rancagua, on the Cachapoal River, to serve the regions around Santiago, Valparaiso and Aconcagua, and according to the *Financial Times* this plant was inaugurated last November. The cost of the scheme was estimated at £15,000,000, its maximum capacity being 99,000 HP and the anticipated annual output 392 million kWh. Power is to be supplied from the new station for the electrification of the Santiago-Cartagena and Santiago-Colchagua sections of the State Railways, as well as to new factories in the area.

Besides this scheme, hydro-electric plants are under construction or are planned at Tocopilla, Copiapó, La Sereha, Coquimbo, Ovalle, Lontué, Maule, Laja, Pilmaiquen and El Volcán. There are three main centres of development, in the Aconcagua region to the north of Santiago, in the area of Rancagua to the south, where the new Sauzal plant is located, and in the Osorno district covering the Chilean lakes. Portland cement production will be the chief industry catered for by the Aconcagua system, with the surplus energy devoted to other new industries and to complete the electrification of the State railways.

INSTITUTION PROCEEDINGS

Charging for Electricity. Telecommunication Engineers.

Further contributions to the much-discussed subject of electricity tariff structures were made by Messrs. C. T. Melling and P. Schiller at the I.E.E. yesterday (Thursday). Before the Wireless Section on Wednesday, Professor Willis Jackson expressed his views on the education of telecommunication engineers. The production of paper condensers was the principal feature of a lecture given recently by Mr. J. H. Cozens before the British Institution of Radio Engineers.

Unification of Tariffs

IT is generally agreed that methods of charging for electricity should be more uniform than they are at present, but it is clear that they will not be made so by voluntary action. That is the opion expressed by Mr. C. T. Melling (Edmundsons Electricity Corporation, Ltd.) in one of two papers submitted to the same meeting in London of the INSTITUTION OF ELECTRICAL ENGINEERS on February 4th.

A preliminary need is for the formation of a satisfactory set of tariffs, as disadvantages and anomalies are associated with most of those now in use. The author accordingly discusses general requirements and fundamental aspects together with the reactions of consumers, domestic and industrial, pointing out how modern requirements indicate that the charge for electricity should be based on the value of the service rendered rather than on the cost of furnishing the supply ; but there should be suitable controls to safeguard the individual consumer. It is along such lines that the supply industry has developed and the author does not believe that radical departure from present practice is necessary.

Economics and Politics

Examination of the limitations of cost analysis in tariff-building shows that there is need for more information about marginal costs, which demands more intensive research. Differences between costs of supplies furnished by various undertakings, due to differences between bulk-supply charges as well as types of area and load, have an important bearing on tariff unification. Close analysis of the implications, both economic and social, of unification of charges throughout the country is desirable before any political decision is made on the subject.

Small supplies to domestic and business premises are discussed in relation to the influence of non-monetary factors ; price discrimination is suggested as an improved method of charging for space-heating load, while the need for improving the bases of fixed charges in two-part tariffs is pointed out.

The paper concludes with an outline (occupying three columns) of a suggested uniform system of tariffs, with an appendix comparing costs in urban and rural areas.

Tariff Correctness

THE second paper to be submitted at the same meeting, by Mr. P. Schiller, had been accepted by the I.E.E. before the author joined the staff of the Electrical Research Association.

The principle of multi-part costing and charging is considered to be as sound to-day as it ever was and, moreover, to be assuming particular importance once again in connection with the development of the domestic thermal load, which necessitates the lowering of the kWh-charge component of multi-part tariffs to the bare minimum. The corollary (characterising a " correct " multi-part tariff) of allocating to the standing-charge component the bulk of the actual fixed costs involved in giving supply is considered by the author to be impracticable with conventional two-part tariffs. At present their fixed component covers little more than the standing costs due to the demand for lighting and small domestic appliances, which is but a small fraction of the total demand of modern household installations. Hence the bulk of the standing costs due to the domestic thermal load has to be averaged out on the kWh-charge component.

Individual Demands

A " correct " household multi-part tariff must take into account the individual consumer's demand, which is increasing justifiable as inter-consumer diversity becomes poorer in consequence of the predominance of space-heating load. Owing to the rigid character of lighting and cooking loads it seems sufficient to consider individual consumers' demands only in respect of their more elastic water-heating and room-warming requirements.

Tariff charges based on actual demand can be put into effect by either recording or limiting consumers' maximum demands during periods of heavy load on the general distribution system. As regards the restrictive alternative, the " contract-demand " method can be developed to the extent of rendering it capable of everything the maximum demand indicator method achieves, while obviating drawbacks inherent in the latter.

The author thus believes that a " correct " domestic multi-part tariff may be found in

a modernised revival of the "contract-demand" method. Whether it would also be an ideal tariff is open to discussion, but the author urges that the principal of charging for household supplies (varying between 0·1 and 20 kW) on the basis of both consumption and demand is at all events worth reconsidering seriously, even if the kW charges have to be less than their theoretically correct values and the kWh charges somewhat greater than their theoretical minima. He suggests that the solution to the problem may be found in the parallel offer of "correct" as well as "biased" domestic tariffs to give consumers the choice between a relatively high fixed charge coupled with a relatively low kWh charge and *vice versa*.

Engineer-Scientists

RECONSIDERATION of the aims of university courses intended for the education of engineers, with particular reference to prospective telecommunication engineers, is urged by Professor Willis Jackson (Manchester University) in a paper prepared for the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS.

Attention is concentrated upon "engineer-scientists", who shall be "capable of interpreting scientific progress in relation to industrial possibilities and of applying scientific methods of analysis to the problems which arise in each progressive stage of development."

The task of producing in adequate numbers men of this group is the joint responsibility of the universities and industry; its satisfactory fulfilment will involve the closest possible co-operation between the two. On the one hand university staff members will need to establish and maintain closer contact with the trend of industrial development and, through their fundamental research work, seek to play a greater part in its early stages. On the other hand selected representatives of industry will be required to participate in the more advanced and specialised stages of the technical work.

Practical Experience

The author maintains that the situation created by the extremely rapid growth of scientific knowledge necessitates more effective co-ordination of the teaching of engineering and of physics at the undergraduate stage as well as the introduction of full-time post-graduate courses. It is suggested that entry to undergraduate engineering courses should be preceded in all cases by one year of general practical training in industry and, further, to post-graduate courses in telecommunications by a year of experience in the practice of that branch of engineering work.

Professor Willis Jackson would encourage long-term research as a prominent feature of university engineering departments, which are considered to be ideally suited to attack "border-line" subjects between pure science and applied engineering. But universities generally are at present unable to find sufficient money to provide such equipment as will enable them to compete on equal terms with industrial concerns carrying out allied investigations.

Reference is made to the need for greater attention to the development of students' personality and of a sense of responsibility in social matters, as well as consideration of men inclined towards the more administrative branches of engineering activity.

Finally the desirability is pointed out of making greater provision for the transfer of outstanding National Certificate students to full-time university courses. The author does not consider those Certificate and City Guilds courses which concern the I.E.E. Wireless Section particularly (namely those which lead to qualifications in telecommunication subjects acceptable to the I.E.E. in lieu of its associate membership examination) because the scope of those courses and their future conduct are so dependent upon contemplated re-organisation that will affect the educational system as a whole.

But the nature of the graduateship qualification of such applicants for I.E.E. associate membership as have been considered by the Wireless Section Committee during the past two years is revealed by the following figures: University degrees in electrical engineering 40 per cent. and in physics 3 per cent.; technical college diplomas 7 per cent., I.E.E. examination (Part II) 16 per cent., Higher National Certificate 11 per cent., Faraday House diploma 7 per cent., City and Guilds examinations 11 per cent., Army Signals courses 5 per cent.

Electrical Condensers

A RECORD attendance of 247 members and visitors heard Mr. J. H. Cozens lecture on condensers to the London section of the BRITISH INSTITUTION OF RADIO ENGINEERS on January 23rd. The author had little to say about mica insulated condensers and referred very briefly to ceramic types. He described the manufacture of paper condensers and dealt at some length with methods of reducing their inductive component, pointing out that there was no such thing as a "non-inductive" condenser.

About half the lecturer's time was occupied with electrolytic types, their construction and the reason for their large capacity being explained. He suggested that a condenser of one farad capacity, about 1 cu. ft. in physical dimensions, would be a practical proposition if its working voltage were limited to 3 V. Mr. Cozens endeavoured to dispel what he called the illusion that power

factor was necessarily a measure of the quality of any condenser, irrespective of the purpose for which it might be employed. His aim was to prove by means of a vector system that in many cases, particularly those of smoothing circuits, the optimum performance was attainable at a definitely critical power factor.

One point that emerged from the subsequent discussion was that greater accuracy would result when rolling condenser foil if the number of turns rather than the length were used as the unit of measurement.

Planning of Science

A "PLANNING of Science" Conference arranged by the Association of Scientific Workers was held last week-end at Caxton Hall, Westminster, under the presidency of Sir Robert Watson Watt. The conference was divided into three sessions, the first (on Saturday) dealing with the use of scientific and technical resources in the war effort, in which proposals were put forward for the setting up of a central scientific and technical board to be in direct contact with the War Cabinet to advise it on scientific matters and to relate the country's scientific effort to the strategy determined by the War Cabinet. The principal speaker was Sir Stafford Cripps.

The second session on Sunday morning was concerned with local organisation, the relationship between management and scientific staffs as it affected production being discussed, while a number of speakers showed how improvement in the planning of science in the various spheres had been accomplished through local action. The last session was mainly confined to the part to be taken by science in dealing with post-war problems and the position of scientists.

Electro-Decantation

RUBBER latex is usually concentrated for purification by applying heat to evaporate its water content, by centrifuging, or by adding creaming agents that cause separation into layers of differing concentration. A more recent method is based on the behaviour of colloidal sols when subjected to electrolysis between vertical semi-permeable membranes, causing stratification into superimposed layers.

The electric field causes particle immigration to the surface of one of the membranes, deposition being then influenced more by gravity than by potential differences if the electrical field is not made too strong. The concentrated layer of particles thus tends to move upward, or downward, along the surface of the membrane in accordance with its relative density with respect to that of the surrounding liquid. Conversely, there is a corresponding reduction of concentration at the other membrane surface, which promotes a flow of more dilute dispersion in the opposite direction to that of the former stream. If this action is allowed to continue the dispersions of differing concentrations will spread through the cell liquid in the form of horizontal layers, which may be decanted by means of equipment patented by the Dunlop Rubber Co., Ltd., and described by Mr. E. A. Murphy in the *Transactions* of the Institution of the Rubber Industry.

Forthcoming Events

Institution of Electrical Engineers.—*Transmission Section.*—Wednesday, February 10th, 5.30 p.m. Paper: "Standardisation of Single-Circuit Overhead Lines up to 33 kV in Great Britain," by Messrs. H. Willott Taylor and K. L. May.

Installations Section.—Thursday, February 11th, 5.30 p.m. Informal discussion on "The Use of Electricity in Relation to Fuel Economy," to be opened by Mr. R. H. Rawll.

Wireless Section.—Tuesday, February 16th, 5.30 p.m. Informal discussion on "Electronics in Industry," to be opened by Messrs. E. Cattanes, G. T. Winch and A. L. Whiteley.

North Midland Students' Section.—Saturday, February 6th, 2.30 p.m. Griffin Hotel, Leeds. Address by the Centre chairman, Mr. W. Fordham Cooper.

North-Eastern Centre.—Monday, February 8th, 6.15 p.m. Neville Hall, Newcastle. Paper: "A Survey of Electrical Sheet Steels for Power Plant and the Factors affecting their Magnetic Properties," by Dr. F. Brailsford. *Students' Section.*—Friday, February 12th, 6.30 p.m. Neville Hall. Paper: "System Operation," by Mr. H. Hilton.

Western Centre.—Monday, February 8th, 5 p.m., S.W. Institute of Engineers, Cardiff. Paper: "Coal for Steam Raising," by Mr. J. N. Waite.

Scottish Centre.—Wednesday, February 10th, 6 p.m. Heriot-Watt College, Edinburgh. Informal paper: "Transformation of Heat and Power," by Mr. J. F. Field, B.Sc.

South Midland Students' Section.—Thursday, February 11th, 6.30 p.m. Loughborough College, Leicestershire. Address on "A Technical View of Modern Production," by Mr. E. A. Deaman, chairman.

North-Western Students' Section.—Saturday, February 13th, 2.30 p.m. Engineers' Club, Albert Square, Manchester. Students' Lecture: "The Failure of the Technician in his Role as Citizen," by Dr. D. S. Anderson.

Royal Society of Arts.—Wednesday, February 10th, 1.45 p.m. John Adam Street, Adelphi, London, W.C.2. Lecture: "Location of Industry," by Mr. R. G. Glenday, M.C., Barrister-at-Law, Economic Adviser to the Federation of British Industries. Chairman: Mr. N. V. Kipping, M.I.E.E., Head of the Regional Organisation, Ministry of Production.

Diesel Engine Users' Association.—Thursday, February 11th, 2.30 p.m. Caxton Hall, London, S.W.1. Paper: "The Development of Paxman Diesel Engines," by Mr. E. P. Paxman, M.A.

Junior Institution of Engineers.—Saturday, February 6th, 2.30 p.m. Manchester Geographical Society, 16, St. Mary's Parsonage, Manchester. North-Western Section annual meeting followed by a talk on "Works Accidents," by Mr. G. E. Windeler.

Friday, February 12th, 6 p.m., 39, Victoria Street, S.W.1. Paper: "Some Production Problems," by A. S. Ladley.

Institution of Mechanical Engineers.—Friday, February 19th, 5.30 p.m. Annual general meeting.

Association of Supervising Electrical Engineers.—Saturday, February 13th, 2.15 p.m. Lecture on "Electrical Installation for Large Buildings," by Mr. J. Flood.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

The Central Register

REGARDING the suggestion that practically all the employable electrical engineers on the Technical and Scientific Register have been posted to duty, it would be interesting to know if men who leave an appointment are automatically reinstated on the Register. For instance, in the section to which I was posted as assistant electrical and mechanical engineer, and from which I resigned for reasons outlined in my letter in the *Electrical Review* of January 14th, four electrical men resigned in the space of two months.

If electrical staff were used up at this rate in the rest of the twenty or so similar sections controlled by the Government Department concerned, which has, in fact, continuously advertised for electrical engineers from the war's beginning up to the present time, then the number of men posted must be much greater than those employed.

My point is that I have only heard once from the Central Register concerning any employment in the war effort, though it is now the fourth year of war.

If the man-power situation is as serious as it is made out to be, I should have thought that greater use would have been made of older men in their technical and professional capacity, even if, like the writer, they are

Hull. "OVER FIFTY."

Rural Electrification

IN his excellent article in your issue of January 22nd, Mr. Cameron Brown, in discussing the proportion of farms connected to the supply, mentions a figure of 448,481 agricultural holdings without cautioning readers unversed in agricultural statistics that the agricultural holdings so numbered (actually for Reports of Crops) are merely parcels of land which may or may not have farm buildings on them.

Since the paddock in which the village publican keeps his horse or the field in which a dealer grazes a few head of stock when waiting to send them to market are both rated as "agricultural holdings," there is a considerable difference between an agricultural holding and a farm.

Unfortunately no definite statistics have ever been published giving the number of farms in the country, but from some local investigations it is obvious that the number must be much less than the number of holdings. For example, in one area of supply it was found that of 1,597 holdings of one acre or more, 415 had no farms on them; the biggest difference occurred in the smaller sizes of holdings, thus 406 holdings of from one to four acres had only twenty-two farms, and in this example the total number of farms was approximately equal to the number of holdings over twenty acres. If such an allowance were made for the whole country, the number of farms situated on the 370,000 holdings in England and Wales listed in the 1937 census could be taken as 213,000.

There are indications that the number of farms is now slightly less than in 1937, and if, as seems probable, there are some 35,000 connected, the percentage already supplied with electricity is about 17 per cent. instead of the 15 per cent. given in Mr. Cameron Brown's article as the national average in the United States.

*London, W.C.*2. "ADSUM."

Regenerative Engine Testing

I WONDER if variable-speed AC commutator motors have been tried instead of Ward-Leonard sets for engine testing. Where applicable I should imagine they would prove much cheaper and more efficient.

A commutator motor generates if it is driven at a speed higher than that determined by brush position (Schrage type) or induction regulator setting (stator-fed type). Like the induction generator magnetising current has to be supplied by the mains, but even this disadvantage may be minimised by methods such as are used for improving the power factor when motoring.

I believe that a stator-fed type of motor of 1,000/250 HP, 1,000/300 RPM was available before the war, so that it does seem that the power and speeds mentioned in the article in the *Electrical Review* of January 8th, could be met.

Chelmsford. J. C. M. SANDERS.

Recommissioning Plant

EVERY old motor or generator reconditioned and restored to usefulness means the saving of labour and material. This work is seldom accepted by manufacturers for various reasons, one being that it would interfere with normal manufacturing routine. It is, however, successfully undertaken by small specialist firms, many of which receive the ready co-operation of the manufacturers. Unemployment of useful electrical machinery is not necessarily the result of war conditions; it may be due to such causes as change-over of electricity

supply, removal of works to new sites or re-organisation of production.

This large and ever-accumulating amount of apparatus is as important as machine tools, for each item is potentially a vital link in the conveyance of power to the machine tool. Many such items are quickly absorbed by industry through electrical trade channels, but the majority remain idle for a considerable time and many good nucleus frames are broken up for scrap. Better means might be found than now exist of keeping a register of this plant, which for the most part is in good or indifferent storage on owners' premises.

As an example of what happens, a motor may have been in use for only one year, through some change in organisation, and then becomes " second-hand " in the accepted sense, although to all intents and purposes it is as good as new. It might have a ready sale in the second-hand market, but its voltage or frequency might not be suitable for the electricity supply system. This handicap can, in most cases, be overcome by competent rewinding.

I know of a recent instance in which a motor-generator, urgently required for Russia, was made up in this way. Despatch was effected in three weeks, whereas ten weeks or longer would have been required for new plant. This illustrates the value of the existing specialist organisations by which the potential value of unemployed plant is recognised, registered, classified and eventually overhauled and put to use.

In wartime, obsolescence should not be considered. A second-hand motor or generator should be regarded as a " ready-made " article. New or " made-to-measure " plant should be requisitioned only as a last resort.

Wembley. E. H. CROOK.

[In the matter of the registration of out-of-use plant, attention may be drawn to the National Stock List mentioned in the " Commerce & Industry " section of this issue.—*Eds. Electrical Review.*]

The Oerlikon Company

SOME of the Sunday papers and other recent British publications have repeated the statements made and written in an article in the New York *Saturday Evening Post* by Mr. Charles Lanius, formerly National Broadcasting Corporation correspondent in Switzerland, accusing Switzerland of being " just one big factory working day and night for the Germans " and saying that " large numbers of Swiss firms, headed by Oerlikons, the gun manufacturers, are working for Germany," etc.

It is not our intention to deal with the largely exaggerated reproaches addressed to Switzerland as a whole and the erroneous premises upon which they were formulated, but we must again take a stand against the innuendo which lies in the use of the name Oerlikon, which traditionally is inevitably coupled with the name of our principals, the Maschinenfabrik Oerlikon, also registered as the Ateliers de Construction Oerlikon. We repeat that Oerlikon is a suburb of Zurich, from which the Oerlikon Co. derives its name. This company was founded in 1876 and early on manufactured principally machine tools. Soon, however, it went over to the production of electrical machinery and apparatus for which it is well known all the world over. The tool section of the business was sold at the beginning of this century to an entirely separate concern, namely, the Werkzeug-maschinenfabrik Oerlikon, also registered as the S.A. de Machine Outils Oerlikon. The factories of both concerns are situated in Oerlikon and this leads frequently, particularly nowadays, to a certain amount of confusion between the two.

May we assert also on this occasion most emphatically that the two companies have absolutely nothing in common. The Maschinenfabrik Oerlikon, *i.e.*, the Ateliers de Construction Oerlikon, manufactures for export exclusively its traditional legitimate products; at present by far the greatest portion of these manufactures is absorbed by Switzerland itself. The company does not make anti-tank or anti-aircraft guns.

*London, W.C.*1. OERLIKON, LTD.,
G. WUTHRICH,
General Manager and Chief Engineer.

I.E.E. Generation Section Proposed

IN view of the continued sub-division of the Institution activities into various sections, I am of the opinion that the time is now opportune for the introduction of a " Generation Section." It would be interesting to know the views of other members.

Shipley, Yorks. T. H. CARR.

American " Uprating " Proposals

THE *Electrical World* (New York) reports that the Westinghouse Electric and Manufacturing Co., in co-operation with the War Production Board, is conducting a campaign to secure the loading of electric motors to the limit as a means of saving materials. Six recommendations have been made :—(1) That motors open to the air should be overloaded 25 per cent. above their name-plate rating unless the surrounding temperature is exceptionally high ; (2) That 440-V motors should be used wherever possible to reduce copper for leads and control apparatus ; (3) That standard sealed sleeve bearing motors should be used unless ball-bearing machines are absolutely essential ; (4) That motors of the highest practical standard speed should be used and the employment of multi-speed motors avoided ; (5) That AC motors should be used in preference to DC wherever possible ; (6) That control and protective equipment should be matched to the nameplate HP rating.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Wimbledon Town Council on January 27th finally decided to pay **Mr. A. E. McKenzie** a superannuation allowance based on eightieths and sixtieths respectively for his non-contributory and contributory service. On this basis Mr. McKenzie will receive approximately £2,056 per annum. Mr. McKenzie has accepted the invitation of the Council to remain in its service for a further twelve months from February 4th, 1943, at a salary of £3,830, this sum to include his superannuation allowance.

Awards have been made to a number of men and women for bravery and distinguished services during the evacuation of Burma last year. The list includes the names of **Col. C. L. Scott**, Chief Telecommunications Engineer, Burma Posts and Telegraph Department, who becomes an O.B.E., and **Mr. D. McGee**, manager, Rangoon Telephone Co., Ltd., who is made an M.B.E. The British Empire Medal has been awarded to **Mr. J. Hancock**, electrical inspector, Burma Railways.

Mr. J. W. Rodger, M.I.E.E., director and chief engineer of Bruce Peebles & Co., Ltd., who has recently been appointed general manager, joined the company at the end of 1924 to inaugurate and develop the manufacture of static transformers, an activity not previously pursued in Scotland. Under his direction as chief engineer and manager of the new department a staff organisation was created, workers were trained and an extensive factory was built, equipped and subsequently extended. Following his promotion in 1932 to chief engineer of the company, with administrative and technical responsibility for all design and manufacturing departments, successful combination of the company's complementary products was achieved. Keenly appreciative of the importance of exports, he travelled extensively in Europe and Canada, acquiring an intimate knowledge of the practice and requirements in these and other countries. He was elected to the board of directors in 1941.

Mr. J. W. Rodger

Mr. Rodger was born at Warrenpoint, Co. Down, and was educated in Northern Ireland. He received his technical education in mechanical and electrical engineering at Bolton Technical Schools, Manchester School of Technology, Belfast, Woolwich Polytechnic, Finsbury, and Goldsmiths' College (University of London). He served his apprenticeship with Paterson, Cooper & Co., and completed his early practical work with Royce, Ltd., Manchester. Several years were spent with Johnson & Phillips, Ltd., on manufacture, testing and installation and eventually on the design and sale of a wide range of apparatus covering arc lamps, searchlights, machines and transformers. Following this and during the several years intervening before joining Bruce Peebles he held the positions of chief transformer designer with Ferranti, Ltd., and the Hackbridge Electric Construction Co., Ltd.

Mr. A. Parkinson, M.B.E., joint managing director of Crompton Parkinson, Ltd., has been appointed deputy chairman of the company and **Mr. E. C. Holroyde** has been appointed a joint managing director.

Mr. S. H. Cross of the General Electric Co., Ltd., completed fifty years of service with the company last month. Mr. Cross has been manager of the company's Wharf and Shipping Depot at Silvertown since 1919. To mark the occasion Mr. L. Gamage, director and general manager, presented him with a gold watch. Export was not a very considerable item in the company's business in 1893 but even in those days it existed and Mr. Cross was connected with it. When an Export Department was created a few years later he was one of its members and has held a responsible position in it ever since.

Mr. S. H. Cross

Brighton Corporation Electricity Committee reports that **Mr. H. Pryce-Jones** will take up his duties as engineer and manager of the undertaking on April 1st.

Miss Olive Poole, of the Hampstead Electricity Supply Department, has won the Elizabeth Sloan Chesser Cup for the demonstrator who gained the highest average marks for the year in the practical tests for the E.A.W. diploma in electrical housecraft. Miss Poole obtained a first class pass with distinction in all three subjects—cookery demonstration, laundry demonstration and salesmanship.

Mr. J. L. Warmington, who has been with W. T. Henley's Telegraph Works Co., Ltd., for over twenty years, has been appointed assistant sales manager in charge of the conductors and telephone cable section of the Sales Department.

Mr. G. Swope, president of the American General Electric Co., has been awarded the Hoover Medal of the American Society of Mechanical Engineers. The award was to be made during the winter convention of the American Institute of Electrical Engineers in New York last week.

Mr. R. H. Martindale, secretary-manager of the Sudbury Hydro-Electric Commission, was nominated as president for 1943 of the Association of Municipal Electrical Utilities of Ontario, but has stated that he cannot find the time necessary for the proper fulfilment of the duties of this office.

Mr. Walter Finlay has been re-elected chairman of the Electrical Fair Trading Council for the ensuing year and **Mr. V. Watlington** has been re-elected vice-chairman.

Mr. C. H. C. Clutterbuck has been appointed a member of the South African Electricity Control Board for a period of three years.

Mr. F. O. Iles has been elected a director of Hubert Davies & Co., Ltd., the South African engineers and shippers. Before joining the company, Mr. Iles was for many years South African representative of Ruston & Hornsby, Ltd.

Obituary

Lord Hirst.—A memorial service for Lord Hirst was held on January 27th, at St. Martin-in-the-Fields, and was attended by the largest and most representative gathering of electrical people for many years, which included distinguished members of every branch of the profession and industry and many other industries. In addition to the household staff of Fox Hill, Reading, over 1,000 representatives of the G.E.C. head office, works and branches were present. The family was represented by Mr. and the Hon. Mrs. Gamage, Group Capt. and the Hon. Mrs. Trevor Rose, Miss Veronica Rose, Mrs. Carol Dreyfus, Capt. and Mrs. A. G. B. Colyer, Mrs. M. J. Railing, and Dr. and Mrs. A. H. Railing.

Dr. C. C. Farr.—The death occurred on January 27th at Wellington at the age of seventy-six of Dr. Clinton Coleridge Farr, D.Sc., F.R.S., F.Inst.P., Emeritus Professor of Physics at Canterbury College, Christchurch, in the University of New Zealand. Dr. Farr was born in Adelaide and received his education there, at University College, London, and at Sydney University. From 1891 to 1895 he was lecturer in mathematics and physics at St. Paul's College, University of Sydney, and in the following year became lecturer in electrical engineering at the University of Adelaide. From 1898 until 1904 he was engaged upon the magnetic survey of New Zealand and established the magnetic observatory, Christchurch, for the New Zealand Government. During the next six years he was lecturer in physics and surveying at Canterbury College, University of New Zealand, and from 1910 until his retirement in 1936, was professor of physics at that college. He was the author of a number of electrical papers which included "The Porosity of Porcelain with Special Reference to High Pressure Insulators for Electric Transmission Lines" and "Tests and Investigation on High Tension Insulation."

Capt. William Clarkson Stewart, formerly of the Commercial Cable Company, died at Plymouth on January 26th. He had command for many years of the *George Ward* and subsequently of the *Marie Louise Mackay*, cable ships that were based on Plymouth. Later he had charge, until he was invalided out about ten years ago, of the *John W. Mackay*.

Dr. F. S. Sinnatt.—We regret to report the death of Dr. Frank Sturdy Sinnatt, C.B., F.R.S., Director of the Fuel Research Station of the Department of Scientific and Industrial Research, which occurred at his home at Greenwich on January 27th. He was in his sixty-third year. Dr. Sinnatt was educated at the Manchester College of Technology and held various posts there before becoming assistant director of fuel research in 1924; he was appointed director in 1931. He was really responsible for the initiation of the national coal survey, for the work may be said to have commenced when he became director of the research association set up by the Lancashire and Cheshire Collieries in 1918.

Mr. E. P. Wrinch.—We regret to record the death in Loughborough Hospital on January 25th, of Mr. E. P. Wrinch, for many years works manager and chief engineer of Petters, Ltd., and afterwards works manager of the engine division of the Brush Electrical Engineering Co., Ltd.

Mr. Wrinch, who was fifty-eight, was educated at Kesgrave School and Christ's Hospital. He commenced his career with a Colchester engineering firm and afterwards was employed in Chelmsford and by the Coventry Ordnance Works, and the B.T.H. Co., joining Petters, Ltd., at Yeovil, in 1914, as charge hand. Upon the retirement of the late works manager, Mr. Easthope, in 1924, he was appointed to that position.

The late Mr. E. P. Wrinch

His exceptional experience in machine tools was a great asset, and he was on many occasions invited to give advice upon the subject. On two occasions he personally arranged for the movement and re-installation of an entire factory equipment. The first was in 1928, when the equipment of the large works of Petters (Ipswich), Ltd., formerly Vickers-Petters, Ltd., was moved to Yeovil. The second, in 1938, when machinery and key personnel were moved from Yeovil to the works of the Brush Electrical Engineering Co., Ltd., at Loughborough.

In 1934 he added to his duties the responsibility of chief engineer and assistant to Capt. R. C. Petter, a director of Petters, Ltd., and during the past four years he was manager of the engine division of the Brush Company. He leaves a widow and son. The funeral took place on January 30th, at Elmstead, near Colchester.

Mr. G. E. Taylor.—We regret to learn of the death of Mr. George Edward Taylor, A.M.I.E.E., governing director of George E. Taylor & Co. (London), Ltd., electrical engineers and contractors, which occurred on January 26th, in his seventy-seventh year.

Mr. R. Hazleton.—The death occurred on January 26th, following an operation, of Mr. Richard Hazleton, general secretary of the Institution of Production Engineers.

Will.—Mr. Thomas Sims Shenton, for many years electrical engineer to the Rugby Borough Council, left £4,183, with net personalty £4,040.

Site for Broadcasting Station

According to the *Daily Telegraph* Swansea City Council has offered to provide a site in its post-war reconstruction scheme for a new B.B.C. Welsh Regional station, in place of the one destroyed in air raids.

COMMERCE and INDUSTRY

Employment of Women. Disposal of Surplus Stocks.

Wages in the Cable-Making Industry

THE Joint Industrial Council for the Electrical Cable-Making Industry announces that advances in wages are being made on the first pay-day in February, 1943, in respect of the period for which payment is made on that pay-day. The increases are as follows:—Adult time workers: An advance of 5s. per week of 47 hours to male time workers 21 years of age and over; an advance of 6s. per week of 47 hours to female time workers 18 years of age and over. Adult piece workers : An advance of 4s. per 47 hours to both male and female workers. Time workers and piece workers under adult age : Appropriate amounts will be fixed for these workers, the payment of which will be made retrospective to the first pay-day in February, 1943, in respect of the period for which payment is made on that pay-day. Notice of the appropriate amounts fixed will be given in due course. The cost-of-living sliding scale method of adjustment of wages is suspended.

Export Control

Under the Export of Goods (Control) (No. 1) Order, 1943 (S.R. & O. 1943, No. 98), which comes into force on February 15th, control is extended to a number of commodities including reciprocating steam engines and additional electrical goods. Among the classes of goods for which licences will in future be required for export to all destinations are reciprocating steam engines and parts thereof, and parts of watt-hour meters. The following goods have been transferred from Group 6 (4) to Group 11 of the Schedule of Controlled Goods :—Steam turbines and turbine condensers ; blade wheels, casings, diaphragms and rotors therefor ; water turbines and casings and runners therefor. Copies of the Order can be obtained from the Stationery Office, price 1d.

Women for Industry

In the House of Commons last week the Minister of Labour and National Service announced an extension of the measures for directing women into industry and keeping them employed. It is proposed to amend the Employment of Women (Control of Engagement) Order to cover women from 18 to 40 years of age (instead of 30) as from February 22nd. Under the Order all employers must engage women between these ages through an employment exchange and workers must obtain employment by this means except in certain special cases. Exemption will still be given to women with children under 14 living with them and those engaged in teaching, nursing or agriculture.

The obligation imposed by the Essential Work Orders upon employers to notify an employment exchange when workers leave or are discharged is to be extended to all employers in respect of men up to 65 and women up to 60.

Wider use is to be made of the power to direct women up to 45 years of age into non-scheduled work, including part-time work and an Order is to be made safeguarding the conditions of employment of these women.

Paper for War Purposes

The good progress made by the Electrical Industry Waste Paper Recovery Committee's scheme should receive further impetus from the " Paper Goes to War " Exhibition at the Royal Exchange, London, which will remain open until February 12th, excluding Saturdays and Sundays. Apart from the multiplicity of uses of paper for aircraft, tanks, munitions, etc., a number of applications of paper in electrical and radio apparatus is demonstrated, *e.g.*, paper-insulated cables, cases for all sorts of apparatus, "Paxolin" (a composition of paper and synthetic resin) insulators, panels, insulating cylinders supporting the coils of high-voltage transformers, etc. Opening the exhibition the Lord Mayor of London, Sir Samuel Joseph, drew attention to some of the ways in which paper could be saved and Mr. J. F. Sutton, president of the Waste Paper Merchants' Association, made a special plea to business men to clear out records and documents that were of no further use.

Conduit Identification

The scheme laid down in 1935 (B.S. 617) for the identification of pipes, ducts, conduit and cables in buildings has not been easy to apply. A new edition of the specification modifies the scheme so that in substitution for the shaped metal discs originally required to be attached to the pipe, identification letters may now be painted thereon in colours contrasting with the basic hues. The latter are unchanged, except for some sub-divisions of water pipes. The system of lettering has also been modified to permit the initial letters of the combinations to indicate the kind of service line. The new scheme is intended to apply to all sorts of buildings, except chemical works for which special B.S. 457 already exists. Copies of these documents cost 2s. each from the British Standards Institution, 28, Victoria Street, London, S.W.1.

Rhodesian Tungsten Production

On behalf of the British Ministry of Supply the Goldfields Rhodesian Development Co., Ltd., Bulawayo, is now recognised as the sole buyer in Southern Rhodesia of tungsten and concentrates including wolfram and scheelite. Hitherto no suitable organisation existed in the Colony for handling small parcels of these ores which were available for export overseas, but now with the appointment of Goldfields Rhodesian Development Co., as official buyer a guarantee exists that all tungsten produced in Southern Rhodesia, in lots of 560 lb. or more, will be exported and prompt payment made. The company is giving its services free. The present price per unit is 100s. f.o.b. Beira.

This arrangement is part of a new policy for increasing the production of base minerals in

the Colony for the United Nations' war effort. The new base mineral regulations are intended to prevent producers from holding out for high tribute rates and waiting for a rise in prices. The Minister of Mines is empowered to investigate any base mineral deposit and order the deposit to be worked to his satisfaction within three months. If the deposit is not then worked satisfactorily the Minister may let it on lease or tribute. He has been given wide powers as regards the regulation and control of production and treatment, storage and exportation of all base minerals.

Quality Control

An evening course of five lectures is being held in the Mechanical Engineering Department of the Polytechnic, Regent Street, London, W.1, on "Quality Control in Production Engineering." Over fifty representatives of various engineering firms are attending the lectures which are given by Mr. A. G. Tyler, M.I.Mar.E. The course will be repeated if there is sufficient demand.

Henley Tape

Henley tape is now being sold by length instead of by weight, at a price per 100 yards instead of per lb. Standard roll lengths for ½-in. and ¾-in. widths are 50, 25, 10 and 5 yards and for 1-in. widths are 50- and 25-yard roll lengths. Conversion from weight to length can be roughly calculated at the rate of 45 yards per inch width per lb. of tape. Although 10- and 5-yard rolls are shown above as standard, production restrictions prohibit the manufacture of these small rolls at present. The use of alternative raw materials during the war period may periodically alter the length/weight ratio and this would necessitate corresponding changes in the price per lb. with possible alterations in the roll sizes. Sale by length has therefore been adopted to preserve as far as possible stable selling conditions for this commodity.

The National Stock List

The National Stock List has now been in operation for a year and has fully justified itself. It was first published in January, 1942, for the purpose of speeding up the war effort by the transfer of surplus ferrous and non-ferrous metal stocks of all descriptions to firms which were in urgent need of them.

Members of the electrical industry will find much to interest them in the publication. Machinery and plant, including electric motors, generating sets and dynamos, as well as sheet, strip, bar, and wire of many different gauges and descriptions, are reported as available in the List. These, naturally, vary from month to month. It is important to note that material can only be reserved against a specific contract, and information as to the purpose for which it is to be used in connection therewith. Material cannot be reserved unless it is for the national effort.

The way in which the scheme works is illustrated by the example of two adjacent war-production plants, of which one had a surplus of processed raw material which was urgently required by the other for the completion of an important contract. They were put into touch with one another through the National Stock List, and the transfer of material was made within a few days.

Firms which have changed their type of work to meet war production needs are frequently in the position of holding supplies which are no longer of use to them, or, on the other hand, of needing metals which they do not normally stock. The National Stock List can be used by all such firms with mutual advantage, if they will make their surplus or requirements known. The List is published on the first of each month, and copies can be obtained gratis from the Directorate of Economy, National Stock List, Berkeley Court (S.E. Wing), Glentworth Street, London, N.W.1. All surpluses should also be reported to this address.

Whitaker's Almanack

One of the principal features of the 75th annual volume of "Whitaker" is the increase in space needed for Government and Public Offices. These Departments required eight pages in the first issue in 1869, and 80 pages in 1939; in 1943 the space is extended to 101 pages. The "Diary of the War" is condensed into sixteen pages, and in response to numerous requests "Government by Party," which appeared in the 1932 edition, is reprinted in the present issue, with an extension covering the period which has since elapsed. An idea of the scope of the new "Whitaker" can be gained from the 80-page index, which contains over 30,000 references. The library edition, leather-bound with fourteen coloured maps, is 21s.; the complete edition, cloth-bound, 10s, and the shorter edition, containing only the first 704 of the 1040 pages of the full book, paper-bound, is 6s.

I.C. Engine Research

Notice has been given that the British Internal Combustion Engine Research Association is applying to the Board of Trade for a licence enabling it to be registered with limited liability without the addition of "limited" to its name. This new Association has as its objects the promotion of research and other scientific work in connection with the internal combustion engine industry and allied industries. For this purpose it proposes to establish laboratories, workshops or factories and to encourage and improve educational facilities in the industry. Its activities will extend to all stationary or portable land engines; marine engines not exceeding 1,500 BHP; and locomotive Diesel engines.

American Economic Advisers

It is reported by the *Anglo-American News* (the official journal of the American Chamber of Commerce in London) that the United States Department of State is establishing a new diplomatic post in a number of the other American Republics to be known as counsellor of embassy for economic affairs. The counsellor will have over-all responsibility for all economic activities and will co-ordinate the work of the representatives of other agencies of the United States which are employed in activities of a commercial or economic nature within the particular country.

In making the announcement, the American Hemisphere Export Office of the State Depart-

ment said that the appointments were to prevent the various commercial agencies from working at cross purposes and to implement economic policy.

An Australian All-Electric Home

What is described as the " Red Cross Dream Home " was recently erected and equipped under the auspices of the *Australian Women's Weekly* at Mosman, Sydney, N.S.W. It was valued at £5,000 and was raffled in aid of the funds of the Red Cross Society.

The house comprises three living-rooms, three bedrooms, kitchen and the usual " offices." An idea of the adequacy of the installation can be gained from the facts that there are 58 lighting points and 25 plug and socket outlets, as well as three clock outlets and five bell circuits. The kitchen is equipped with a 7·4-kW cooker and there is an 85-gal. 3-kW off-peak storage water heater. Kitchen equipment includes a dish-washer, washing machine, refrigerator and a full range of the smaller electrical appliances. Central heating is apparently employed, for the only heater mentioned is a 2-kW radiator in the bathroom.

Eire Lamp Imports

The Control of Imports (Quota No. 31, 13th Period) Order, 1942, appointing the period February 1st to July 31st, 1943, as the thirteenth quota period for certain electric filament lamps, fixes the quota of imports into Eire for the period at 100,000 articles.

E.A.W. Activities

The Electrical Association for Women is to hold a series of lectures each Wednesday afternoon until March 8th at 20, Lower Regent Street, S.W.1, in conjunction with the Ministries of Food and Fuel and the Board of Trade, in connection with their economy campaigns.

Fatalities

Evidence was given at the inquest on an eleven-year-old boy, Leonard Stanley Walder, at Hammersmith last week that he was found lying in an air-raid shelter with a pair of wire cutters in his right hand. A cut was found in the electric cable nearby. The coroner, recording a verdict of " Accidental death," said that the boy had no business in the shelter and his interference with the cable killed him.

A verdict of " Accidental death " was recorded at an inquest at Braintree recently on Daniel Wright Sargeant (67), a hoist attendant. It was stated that while he was standing on a ladder to repair the hoist his head apparently came in contact with a live electric cable and he plunged head-first backwards to the floor, his feet remaining upon the rung of the ladder on which he had been standing. His neck was broken and there was a burn mark across his face. He was used to electrical work, and it was assumed that he would not have gone near the cable without first switching off. Medical evidence showed that he was alive when his head struck the ground.

An electric bowl fire falling into a bath caused the deaths of two boys at Derby. They were Joseph Lager (15) and Barry Lager (5). The bowl fire, which was plugged into a pendant lamp socket, was normally kept in the bedroom, from which it must have been taken by one of the boys and placed on a table in the bathroom. The table had been upset. At the inquest Dr. L. Brown said that if there had been skilled first aid within a few minutes the boys might have been saved. The Coroner, recording a verdict of " Accidental death," said the tragedy again emphasised the danger of having portable electrical apparatus in a bathroom. It also stressed the importance of prompt notification to the police, who had full first-aid equipment.

Sydney Wilcox, an employee at a Royal Ordnance Factory in the Midlands, was killed recently when he came into contact with an electrified fence.

Trade Announcement

A new company (G-B. Kalee, Ltd.), the formation of which is announced, will incorporate the manufacture, distribution and the service facilities of G-B. Equipments, Ltd., and Kalee, Ltd. Behind the new company will be the resources of the following specialist organisations :—British Acoustic Films, Ltd., A. Kershaw & Sons, Ltd., Pixtons, Ltd., and Kalee, Ltd.

Changes of Name

The name of the Vactite Wire Co. (1919), Ltd., has been changed to the Vactite Wire Co., Ltd. (To July 10th, 1942, 15,000 shares had been issued, of which the London Electric Wire Co. and Smiths, Ltd., held 14,997).

The title of Rail Brakes, Ltd. has been changed to Metropolitan-Vickers-GRS, Ltd.

The title of Herbert C. Atkins, Ltd., has been changed to Raglan Engineering Co. (Nottingham), Ltd.

Thermolite, Ltd., has changed its title to George Tepper & Co., Ltd.

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be entered within a month from January 7th :—

RESAMINE. No. 620,710, Class 1. Soldering fluxes, being preparations containing amine compounds.—British Insulated Cables, Ltd., Prescot, Lancs.

KENUTUF. No. 621,054, Class 9. Parts (not included in other classes) of scientific, nautical, surveying and electrical apparatus and instruments (including radio), etc. No. 621,055, Class 11. Parts (not included in other classes) of installations for lighting, heating, steam generating, cooking, refrigerating, drying, ventilating, water supply, etc. No. 621,058, Class 17. Insulators and insulating materials. All the above items refer to goods wholly or partly of thermo-setting or thermo-plastic mouldable materials.—J. F. Kenure, Ltd., Fagg's Road, Feltham, Middlesex.

COOBEX. No. 621,191, Class 11. Reflectors, being parts of heating and lighting apparatus.—Pendleton Electrical & Wireless Co., Ltd., 196, Deansgate, Manchester.

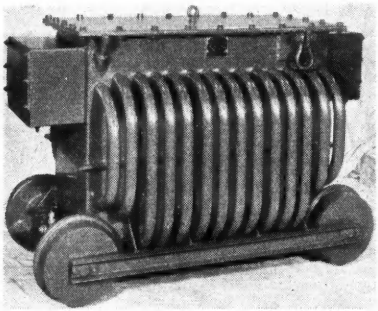
Manufacturing Progress—III

Important Home and Overseas Contracts

As in the case of previous notes under this heading (ELECTRICAL REVIEW, *Jan. 8th and 15th*), *a notable feature of the following survey is the production of plant for shipment overseas.*

Brush Electrical Engineering Co.

A STEADY flow of orders for Ljungstrom turbines for both the home and export markets is recorded by the Brush Electrical Engineering Co., Ltd., which states that the capacity installed during 1942 reached 100,000 kW and that several more sets of up to 50,000 kW output are under construction. Active business has been done in alternators for water-turbine, internal-combustion-engine and steam-engine drives, and generators have also been supplied for electrolytic purposes.

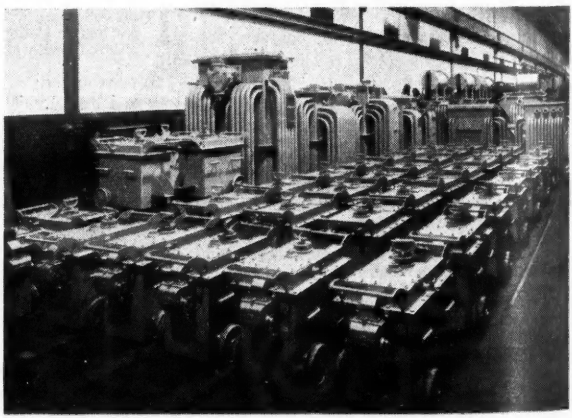


A Brush transformer for use in collieries

Contracts for transformers include one covering a large number of distribution types ranging from 75 to 500 kVA. Among the larger sizes built were a 10,000-kVA and two 7,500-kVA units with a ratio of 33/11 kV, equipped for "on-load" tap changing, and three 5,600-kVA 6,300/3,150-V units. Small air-cooled single-phase transformers with a single secondary turn have been manufactured in large quantities for use in equipment for the re-tipping of machine tools. A low-height design transformer has been developed for underground use in collieries which caters for conditions of lowering down the pit and transport in-bye. A range of AC welding plant has been developed to comply with B.S. 1071-1942 in 3–, 6– and 12–operator sets with a welding capacity of 300 A per operator.

Switchgear developments include metalclad air-insulated equipment for vertical isolation intended mainly for use on high-voltage networks up to 11-kV where short-circuit fault values do not exceed 150 MVA. This range provides for complete interlocking, unrestricted access for routine maintenance and facilities for extension without structural alterations.

Motors have been supplied from ¼ HP upwards for special applications in practically every industry, including some for driving power-station auxiliaries. The company has extended the range of its new screen-protected motors, which are now made with capacities from 25 to 1,500 HP.



Portable G.E.C. oil-immersed single-operator welding sets awaiting shipment

General Electric Co., Ltd.

ONE of the most notable features of last year's manufacturing activities was the increasing use of arc welding, with which were associated important developments in the technique of high-speed methods involving the use of special electrodes and deep penetration. This has led to the adoption of means of manipulation of components, so as to enable the maximum amount of welding

to be prepared in the downhand position. The General Electric Co., Ltd., reports having supplied a large amount of welding plant, both as portable units of up to 450 A output and as large multi-operator equipments (designed to B.S.S. 1071) for shipyards and other constructional work.

Orders received by the G.E.C. from the U.S.S.R. included some for turbo-alternators up to 25,000 kVA, indoor and outdoor switchgear (the latter for operation in temperatures below zero), motor-generators for chemical deposition processes and a large number of motors constructed for various outputs.

Among the generating plant supplied to home users were 3,000-RPM condensing turbo-sets of 37,500 kW and lower outputs, and back-pressure and pass-out machines ranging from 3,000 to 12,000 kW. Typical of steelworks plant constructed was an 800-HP, 0–400–800-RPM, reversing mill motor and two compound-wound reversing reel motors with Ward-Leonard equipment, a 200-HP skin-pass motor with remote contactor control and a 500-kW rectifier equipment.

The replacement of an engine drive of a rod mill by a 1,000-HP, 197-RPM, 11-kV slip-ring motor entailed, owing to restricted space, the provision of trunnions on the stator to enable it to be canted over to an angle of 45 deg. on site for the purpose of hauling it into position.

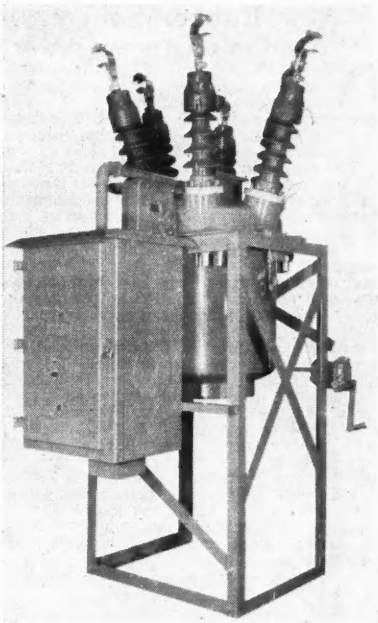
An order for South Africa comprised sixty-four metalclad switchpanels of a type recently developed by the company with rupturing capacities of from 150 to 350 MVA at 11 kV. A number of solenoid-operated 6·6-kV 750-MVA oil switches were completed for a large British power station. A squat design of 25-MVA unit-type flameproof switchgear was developed for use in fiery mines for voltages up to 3·3 kV.

Grid-controlled 1,250-A pumpless air-cooled rectifiers have been produced within the past year. Several mobile substations (for road and rail mounting) of capacities of 1,000 kW and under (at from 110 to 500 V DC) have been built and others, both of standard construction and of unit type (with rectifier, transformer and switchgear on a common bedplate) have been supplied to home and overseas markets.

Notable among the plant built at the Fraser and Chalmers works were two complete equipments for sintering iron ore fines to an amount of 600 tons of sinter a day by the Gruenwalt process. A concentrating plant to deal with 2,400 tons of fine iron ore a day is being erected abroad. For the recovery of iron pyrites from colliery washing refuse in connection with the production of sulphuric acid, a crushing and water concentrating plant has been supplied with a capacity of 500 tons per day.

Ferguson, Pailin, Ltd.

CONTRACTS completed during the past year by Ferguson, Pailin, Ltd., include a six-panel, 33-kV switchboard for a main generating station in Great Britain. The circuit-breakers have a short-circuit rating of 750 MVA and the phase-separated busbars, which are of the condenser-bushing type, are in duplicate. Among other completed contracts were several for 6·6-kV and 11-kV 750-MVA heavy metalclad switchboards of up to thirteen panels. In some cases special busbar sectionalising arrangements for the purpose of localising any damage were incorporated. Many orders were carried out for metalclad switchgear rated at 250 and



Outdoor circuit-breaker for very low temperatures

350 MVA and for the company's standard substation types.

In addition to new work, several schemes for modernising existing switchgear have been undertaken involving the fitting of cross-jet pots and electrical- or spring-closing mechanisms. During the year the development of pneumatic-closing gears was continued and these are now available for all standard sizes. Pneumatic operation has also been applied to isolators, both electrical and mechanical interlocks being incorporated.

A new design of rotary selector switch is built up of shaped moulded discs and contacts, which can be arranged to give various connections for circuit correction and change-over. A considerable number of circuit-breakers with heaters in the oil have been made for outdoor service at exceptionally low ambient temperatures.

A range of air-insulated metal-enclosed switchgear has been introduced for duties up to 500 MVA, 15 kV and 2,500 A. Control boards are now being manufactured without beading between the panels. The mimic diagram is at a convenient height across the panel and the circuit-breaker control switches are incorporated in the lines of the diagram.

New Rubber Sources

South African and American Projects

INVESTIGATIONS proceeding in South Africa aim at the production of rubber from the *euphorbia tirucalli* trees which grow in large numbers in Natal, while in the United States progress is being made with a plan to obtain rubber from guayule shrubs.

With regard to the former, the *South African Engineer and Electrical Review* reports that tests are to be carried out by the Dunlop Rubber Co. on local rubber prepared by Natal Estates, Ltd., Mount Edgecombe. A variation in the quality of the latex brought in by native tappers was found to be due to the fact that they had tapped trees of other types. Steps have been taken to prevent a repetition of this and instruments have been devised to ensure the correct type of latex.

At Salinas, California, the first guayule crop is now being harvested, states a *Daily Telegraph* correspondent. It will provide 600 tons of milled rubber from the 550 acres so far planted. Under the present programme, however, 500,000 acres are to be planted, and it is estimated that in two years from now these will produce 21,000 tons of rubber, with an annual output thereafter of 80,000 tons. Plantings will be made not only in California, but also in Texas, New Mexico and Arizona. It has been estimated that 600,000 tons of rubber a year would be enough for the normal peace-time requirements of the United States. Botanists are still trying to breed a shrub which will yield greater quantities of raw rubber.

Electricity in the Home

Collation of Women's Ideas

THE three thousand replies received to a questionnaire sent out by the Women's Advisory Housing Council provide an instructive cross-section of the demands of housewives in this country for electrical services. Over 96 per cent. of those who filled in the questionnaire (mainly in the lower-income classes) state that electricity is available in their district, and even the replies from the rural districts with populations of under 5,000 give a figure of 94 per cent. It appears that many more women would utilise electricity for cooking and heating if the cost of supply was lower, and while less than 1 per cent. use electricity only for heating, over 22 per cent. would *like* to use electricity only. Apparently there are still no less than 86 per cent. not using electricity for cooking of any description and of these nearly a quarter do not use gas either, having still to rely on coal or oil. Asked the question : " Which method do you like best for cooking ? ", 43 per cent. of the women say they prefer gas only, 26 per cent. electricity only, 17 per cent. coal only, the remainder liking alternative methods. There would appear to be plenty of scope here both for electrical education and development.

From the suggestions made it is obvious that the housewife is fully aware of the modern labour-saving facilities available and the frequent request for constant hot-water supplies and electric points in every room indicate that the water heater, vacuum cleaner, electric fire, iron, bedside or reading lamp, and radio are amenities that she feels strongly should be made available to her and not merely remain the privilege of her wealthier fellow housewives.

An overwhelming vote (90 per cent.) for the refrigerator also indicates that the modern housewife realises the economy of this appliance in saving food and keeping it free from contamination, but again it is the price that is the deterrent. Two-way switches on stairways and passages, as well as more accessible meters and fuse-boxes, are desired as being temper- and labour-saving. The dislike of concrete floors is worth commenting on in view of schemes now being considered for the erection of pre-fabricated concrete houses after the war.

Melbourne Tramways

Financing Post-War Renewals

AN amendment of the Act governing the finances of the Melbourne & Metropolitan Tramways Board provides that for the duration of the war a maximum of 9 per cent. (instead of 6 per cent.) of the declared capital value of the undertaking may be allocated to the renewals reserve fund. This has been done in order that the Board may be prepared for the large amount of renewal and reconstruction work that will be necessary after the war. If the abnormal surpluses at present being earned were distributed according to the Tramways Act among the metropolitan municipalities, the Board would be forced to borrow to finance the post-war programme. The Act lays down that any surplus above £10,000 shall be distributed among the municipalities, and that in the case of deficits the Board shall be entitled to levy a rate. The latter power has not been exercised, however, and during the years of financial depression the Board's reserve fund has been depleted by £1,500,000.

The Board's operations during the year ended June 30th last brought in a record revenue of £3,437,743 (compared with £2,772,871 in the previous year) ; tram receipts increased by £476,461 and bus receipts by £245,798. Working expenses were £2,014,331 (against £1,701,794) and there was thus an increase in the gross balance of £352,335. On the new basis £714,076 (against £475,453) is placed to renewals reserve and after providing for various charges a surplus of £50,000 is distributed among the municipalities.

IN THE COURTS

Workman's Wages Appeal

ON Friday, in the Court of Appeal, William Henry George, of Slough, who had been employed as a night foreman at £11 a week by a North Kensington firm of engineers, appealed from the dismissal by Windsor County Court of his claim for £92 10s. wages. It was stated that, having been refused leave from the Ministry of Labour to dispense with George's services, the company afterwards declined to allow him to continue as night foreman at £11, but offered him work at £8 a week. This offer was refused by George, who had since got work at £8 a week elsewhere.

The appeal was allowed, the Court ruling that a workman who under the Essential Work Order could not be discharged or voluntarily leave his employment, was entitled to be paid the normal wages for the job he had been doing even though he had been put on less important work.

Alteration of Objects

In the Chancery Division last week Mr. Justice Bennett had before him a petition by the Watford Electric & Manufacturing Co., Ltd., for the confirmation by the Court of an alteration of its objects. It was stated that the company desired to include in its operations the payment of pensions and other allowances, directors engaged the whole of their time being included in the scheme. The company had no debenture debt, and was a very prosperous one. His Lordship confirmed the alteration.

"Music While You Work"

In the Chancery Division last week Mr. Justice Bennett decided that reproductions of copyright music in a factory were an infringement of copyright. The action was brought by the Performing Right Society against Gillette Industries, Ltd., who had installed apparatus in their factory for the relaying of broadcast music and the reproduction of gramophone records and had performed the works which were the subject of the action.

The plaintiffs asked for a declaration that the defendants were not entitled to do this without the leave or licence of the plaintiffs as owners of the performing rights in the music. Mr. Justice Bennett granted this and gave liberty to apply for an injunction ; costs would be paid by the defendants.

Mr. Justice Bennett commenced the hearing of an action on January 27th brought by Ernest Turner Electrical Instruments, Ltd., claiming against the Performing Right Society a declaration that the performance in their factory of music, the rights of which were held by the defendants, did not constitute an infringement of copyright. The plaintiffs, who said that they had fifty loudspeakers installed in their works, contended that the performances were in private, both as regarded broadcast relays and gramophone records.

For the defendants it was maintained that the plaintiffs had shown no cause of action or right to relief and counterclaimed for an injunction restraining the plaintiffs from infringing the defendants' copyright.

In giving judgment Mr. Justice Bennett pointed out the similarity of the case to that brought against Gillette Industries Ltd., although in this instance the Performing Right Society were the defendants. The only question for decision was whether the works mentioned had been performed "in public." He held that they had been and as the plaintiffs had stated that they proposed to continue to perform them he could not refuse to grant the defendants the injunction which they claimed. The action would therefore be dismissed.

Upon counsel for the plaintiffs undertaking that his clients would not perform the works in question the injunction was not granted and the operation of the undertaking was suspended pending an appeal.

Overcharge for Lamp Bowls

At Glasgow Sheriff Court on January 21st, A. & C. Edelman (1939), Ltd., electrical contractors, 185, Howard Street, Glasgow, were fined £10 for selling six electric light bowls for 10s. 6d. each, plus Purchase Tax, when the basic price was 4s. 6d. together with any permitted increases. On behalf of the company it was stated that taking various permitted increases into account an overcharge to the extent of 1s. 8½d. per globe was admitted, but it was not understood how the basic price of 4s. 6d. was arrived at having regard to prices quoted by comparable firms.

Waste of Electricity

Two defendants were each fined £1 at Portsmouth recently for wasting electricity. In one case a lamp was left burning for 7½ hours while the defendant was out of the house, and in the other 900 W was similarly wasted.

The defendant in the first prosecution at Barnsley for a breach of the Waste of Fuel Order was Reginald Bullock, of Sheffield, who left an electric fire burning at his business premises at Barnsley on the night of December 15th. He was fined 10s.

Winding-up Petition

A petition for the winding-up of Electrical Utilities, Ltd., was presented to the High Court on January 25th by Dowding & Doll, Ltd., and will be heard in London on February 8th.

Studio Lamps

BECAUSE of the strenuous conditions to which studio spotlight lamps are subjected in service B.S. 1075 has been issued in response to representations made by their manufacturers with the co-operation of several cinematographic organisations and photographic film manufacturers. This fresh specification is similar in form to those dealing with standard lamps, with the addition of a section on lamp housing, flexible cables and cable lugs. Copies are obtainable from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 3d. post free.

PARLIAMENTARY NEWS

By Our Special Reporter

LAST week in the House of Commons Mr. Liddall asked the Minister of Fuel and Power whether his attention had been drawn to the effect upon the cost of electricity for industrial purposes of the increase in the cost of coal in the last ten years and to the fact that electricity undertakings had incorporated in their agreements a coal clause which only took account of the cost of coal per ton, and not of the increased thermal efficiency of generating stations ; and if he would direct the Electricity Commissioners to discuss with the industry a form of coal clause more suited to the circumstances.

Major Lloyd George said that this subject was somewhat complex and even if it were possible in present circumstances to agree a coal clause of substantially general application, it could not be made generally operative without interfering with numerous existing contracts entered into freely between industrial consumers and electricity undertakings. Further, the benefits derived from improving thermal efficiency, had unfortunately during the war proved less substantial than in peacetime conditions. If, however, Mr. Liddall would send him particulars of any case where, in his view, a coal clause was not working equitably, he would be pleased to refer it for consideration to the Electricity Commissioners.

Additional Meters

Sir William Davison asked the Minister whether he was aware that, by the direction or with the approval of the Ministry, users of electricity in London were being required to install separate meters for lighting, heating and cooking at considerable cost and with no object, seeing that a rationing scheme was not to be introduced; and what action it was proposed to take in the matter.

Major Lloyd George said he was aware that some consumers of electricity in London had insisted on changing over from a two-part tariff and that as a result, separate meters and separate wiring had become necessary in some cases. In present circumstances, it was clearly contrary to the national interest that materials and labour should be used for this work of separate wiring and installing separate meters. Accordingly, the Electricity Commissioners were urging upon the undertakings the necessity of offering consumers a suitable alternative form of tariff which would obviate the necessity for separating the wiring and installing additional meters. If Sir William knew of any case where an electricity undertaking was still pressing upon consumers a tariff which would involve separate wiring and installation of separate meters, he would be very glad to ask the Electricity Commissioners to investigate the case.

The Battery Shortage

In reply to questions regarding the shortage of batteries the President of the Board of Trade said that supplies of hearing-aid batteries were reported by the manufacturers as reasonably satisfactory, except for one low-tension type, the shortage of which was due to urgent Service requirements. He had impressed on those concerned the importance of increasing production, and he hoped that there would be an early improvement.

Following recent complaints of shortages of cycle-lamp batteries, he had arranged with the manufacturers for increased supplies to be sent to many parts of the country, including a number of places in the West Midlands.

On the following day, Capt. Waterhouse said that there were fewer No. 8 batteries this winter than last owing to supply difficulties. The manufacture of No. 8 cases had been prohibited since September 7th, 1942. Those members of the public for whom a torch was indispensable should change to a larger and more economical type of torch only if they found themselves permanently unable to obtain No. 8 refills. He must emphasise that it was quite unnecessary that everybody should do this, as very large quantities of No. 8 batteries were still being produced.

Radio Sets and Components

Answering a question by Sir Ian Fraser, the President of the Board of Trade said that he fully realised the importance of providing sufficient new civilian wireless sets and of keeping existing sets in use. Arrangements had been made to supply components for the completion of over 100,000 sets now in process of manufacture. Steps had also been taken to maintain adequate supplies of components, valves and batteries, subject only to the essential requirements of the Services.

Large Quebec Scheme

Power for Aluminium Industry

MR. T. A. Crerar, Canadian Minister of Mines and Resources, stated recently that a large hydro-electric scheme under construction in Quebec to meet the wartime needs of the Arvida plant of the Aluminum Power Co. would ultimately have a capacity of approximately 1,000,000 HP. The project was so huge that it took a full day to walk round it. It was months ahead of schedule and more than 10,000 men had been employed at peak periods, with the working schedule continuing every hour of every day of the week.

Mr. Crerar added that this great scheme in its finished state would represent only one-third of the new hydro-electric installations in Quebec this year. The total of new installations in the Province in 1942 was 280,400 HP. The Aluminum Power Co. added two units of 55,000 HP each to its Chute-a-Caron generating system on the Saguenay River and brought the first two 85,000-HP units of its great Shipshaw development on the same stream into operation. The installation of eight similar units now on order and the transference of the two units of 55,000 HP from the Chute-a-Caron station were planned, he said.

The Shipshaw development, as stated by Mr. Crerar, would thus ultimately have ten 85,000-HP units and two of 55,000 HP transferred from Chute-a-Caron, making 960,000 HP.

ELECTRICITY SUPPLY

Highlands Scheme Questions. Wimbledon Rebate.

Aberdeen.—CORPORATION AND THE HYDRO-ELECTRIC BILL.—The Electricity Committee, on the recommendation of the electrical engineer (Mr. A. Gardner), has appointed the convener, town clerk and electrical engineer to see that the city's interests are safeguarded in the Hydro-Electric Development (Scotland) Bill. In a memorandum on the report of Lord Cooper's Committee, drafted before the terms of the Bill became known, Mr. Gardner says that the proposals practically amount to this : that the Aberdeen generating station shall not be extended further, and that all further supplies of electricity to meet growing demand shall be obtained in bulk form from the new Board. The station would not necessarily be shut down, but would have to be operated to the instructions of the Control Committee. Mr. Gardner considers that, on the terms of the report, Aberdeen ought to be able to buy a bulk supply at absolute cost price delivered at Aberdeen, but there is no estimate of what this cost would be or how it would compare with local generation. In this connection he recalls that although the city of Chester could generate electricity more cheaply than the grid, it was compelled, without reason given, to take the grid supply. He therefore suggests that Aberdeen should secure protection against being forced to buy electricity from the Board at a price higher than that at which Aberdeen could produce it itself.

With regard to the new Board being authorised to give supplies direct to electro-chemical or electro-metallurgical industries even if they are within the area of an existing undertaking, Mr. Gardner is of opinion that the principle is dangerous and watch will have to be kept that such powers of direct supply, if granted, are not extended to other industries in the area of an existing undertaking, to the detriment of that undertaking.

Croydon.—DISTRIBUTION WORKS.—The Corporation has arranged for the Electricity Department to extend and improve the electricity supply to the town hall and central library at a cost of £1,088.

Edinburgh.—STREET LIGHTING PROPOSAL.—The Streets and Buildings Committee is to submit a scheme for improved lighting, and the inspector of lighting and cleansing is to prepare a report on the subject. Councillor Horne, who moved the resolution to this effect at last Thursday's meeting, said that by means of four master switches most of the lights in the city could be put out as quickly as the lamps on a motor-car. Councillor Farrer, who seconded, said that if, along with a scheme for better lighting, they sent to the Ministry a list of the accidents which had occurred in the city, he was sure some improvement in the lighting would be permitted. The lighting would have to be properly controlled. Opposition to the resolution was on the ground that installing a modified system of street lighting would mean using essential labour and materials required in the war effort. On a division the resolution for improved lighting was carried.

Leicester.—REDUCED CONSUMPTION.—Compared with a year ago there was a 6 per cent. saving of electricity by consumers supplied through quarterly meters during the three months to the end of December.

London.—ST. PANCRAS JUBILEE.—In referring to the chief electrical engineer and manager's report for the year ended March 31st, 1942, the St. Pancras Electricity and Public Lighting Committee records the fact that this was the fiftieth complete year's working of the undertaking. In this jubilee year the undertaking has stood up to every difficulty and its financial stability has been maintained, the Committee states.

DAMAGE TO SHELTERS.—In a report to the Hammersmith Borough Council the Civil Defence Committee draws attention to the extensive wilful damage to public and communal air-raid shelters and equipment. During the six months ended September 30th last the cost of repairing such damage was approximately £2,000. Electrical installations have been frequently tampered with and parts stolen, while on one or two occasions fires have been started. At one time the stealing of electric lamps was a considerable problem, but now the minimum number of lamps are left in position.

J.E.A.'S BORROWING POWERS.—The Electricity Commissioners have informed the London and Home Counties J.E.A. that the Treasury is unable at the present time to grant the Authority's application for an Order increasing its borrowing powers. It is stated that this decision in no way implies an embargo on the development of the Authority's services after the war and the postponement of the Order will not be allowed to place the Authority at a disadvantage as compared with other undertakers as regards access to the capital market.

COOKER HOTPLATES.—The chairman of the J.E.A. recently approached the Ministry of Fuel and Power pointing out that the use of cookers with inefficient equipment was wasteful and referring especially to the need for the replacement of defective hotplates. The Minister says that he realises the importance of preventing the wasteful use of cookers but the labour and production position does not justify his urging manufacturers to accelerate programmes for meeting the Authority's requirements. He trusts, however, that the programmes they have put forward will go some way towards overcoming the present difficulties.

WANDSWORTH.—The Borough Council has approved plans for the laying of underground electric cables by the County of London Electric Supply Co., Ltd.

Middlesex.—SANATORIUM INSTALLATION.—The County Health Committee is to alter the electrical installation at Clare Hall sanatorium at a cost of £700.

Peebles.—ELECTRIC LIGHTING PREFERRED.—At a meeting of Peebles County Public Health Committee a memorandum to be sent to the Scottish Housing Advisory Committee suggested that wherever possible lighting should be by

electricity. It was stated, however, that the cost of electricity over the whole county was excessive, and in the purely rural areas the cost of installation was prohibitive.

Stockport.—LOANS SANCTIONED.—The Electricity Committee has obtained sanction to loans for mains, services, substations, switch-house plant, etc.

Urmston.—SUBSTATION.—The Urban District Council has passed plans for the erection of a substation for the Stretford and District Electricity Board.

Wimbledon.—REBATE V. REDUCTION.—Although a proposal to allow rebates to all electricity consumers was welcomed and unanimously approved at the last meeting of the Borough Council it gave rise to a lively debate. One point raised was whether it would not be better to reduce the charges instead of having spasmodic rebates. In this connection it was stated by Councillor H. W. Lewis that the Electricity Commissioners had made a request last May for a reduction in the price of electricity, but they were told that this could not be granted because of the uncertainty of the weather and its effect on m.d. charges. To this Ald. Dudley Stuart replied that he knew of several authorities who had reduced their charges and had got in a "fearful mess" so that they had to put up the charges again. He thought the Electricity Committee was to be congratulated on the way it had managed the finances of the undertaking enabling them to have electricity at such a low cost.

Ald. A. W. Hickmott, who had earlier referred to the Electricity Commissioners' request, said that if there had been a cold spell in November or December like that experienced three years ago they would have "used up £20,000 or £30,000 in half an hour in supplying heat."

Coun. T. Braddock thought they could have given rebates in each of the past six years, but Ald. Stuart pointed out that they had made a reduction in price notwithstanding the very much higher cost of coal.

Replying to a question by Ald. J. S. H. Abbott whether the £12,000 that would be returned to consumers would be taken into account in assessing the electrical engineer's pension, the Town Clerk said that the period on which Mr. McKenzie's superannuation allowance was determined was prior to the quarter in question.

All consumers supplied through meters are to be given a rebate of 10 per cent. on the total amount of their accounts for the December quarter, and consumers on the maximum demand system are to receive a rebate of 25 per cent. of the weekly rental for the four weeks commencing January 5th. The Electricity Committee had recommended that these concessions should only be granted if accounts were paid within a specified period, but the Finance Committee advised that this condition would be illegal.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Radio Rentals, Ltd.—The annual meeting was held on January 26th when Mr. H. F. Hunt (chairman), who presided, said that the demand for the company's service was far beyond anything with which they could cope and the supply of new sets was at present limited. Nevertheless they had managed still further to increase the number of subscribers.

With regard to their subsidiary company, they had applied the dividend so far received in reduction of the investment, since it was earned prior to their acquisition of the company. A full year's results were not yet available from the date of acquisition, but he could say that satisfactory profits were being earned by the subsidiary.

The Adelaide Electric Supply Co., Ltd., reports a gross revenue for the year to August 31st of £1,451,237, as compared with £1,258,109 for the preceding year, and after deducting operating expenses and taxes the net revenue is £488,911 (against £493,468). After providing for debenture interest and sinking funds and allocating £129,136 to general reserve, there is a balance of £260,321. The final dividend on the 8 per cent. preferred ordinary stock is 4 per cent., and on the ordinary stock 5 per cent., making 10 per cent. (same) for the year and leaving £155,340 to be carried forward. The sales of electricity during the year totalled 224·3 million kWh (against 173·3 million kWh) and the number of consumers increased by 2,429 to 110,078.

R. A. Lister & Co., Ltd., show a profit, after meeting taxation, of £121,007 for the year to September 30th last (against £90,280). After transferring £25,000 (against £15,000) to general reserve and £30,000 (against nil) to stock contingencies reserve and maintaining the ordinary dividend at 16 per cent. (final 5 per cent. with 6 per cent. bonus), £71,475 (against £70,468) is carried forward.

J. & E. Hall, Ltd., are paying an ordinary dividend of 10 per cent., less tax, for the year ended September 30th (against 8½ per cent.). The net profit for the year was £82,429 (against £72,911).

Joseph Lucas, Ltd., announce that their offer to purchase the shares of New Hudson, Ltd., has been accepted by over 90 per cent. of each class of shareholder.

The Electrical & Industrial Investment Co., Ltd., has again declared a dividend of 12 per cent. on the deferred shares.

New Companies

Chadderton Radio & Television Co., Ltd.—Private company. Registered January 15th. Capital, £500. Objects: To carry on the business of electricians, radio and electrical engineers, coil and armature winders, dealers in batteries, accumulators, insulating materials and accessories, etc. Directors: S. Jamieson and A. Jamieson, both of 17, Fernlea Avenue, Chadderton, Oldham; T. Godfrey, 261, Feather-

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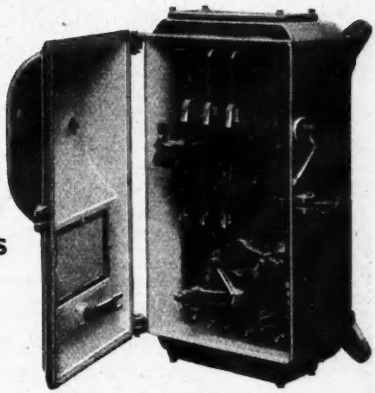

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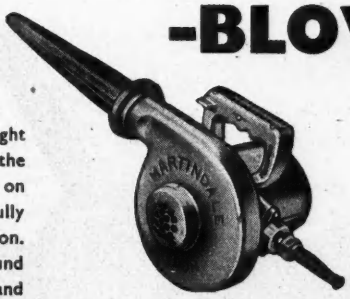

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stall Road North, Oldham; R. T. Shaw, 24, Church Street East, Waterhead, Oldham; and H. H. Speight, 952, Oldham Road, Rochdale. Registered office : 180, Chadderton Road, Oldham.

McGovarin (Refrigerators) Ltd.—Private company. Registered January 22nd. Capital £1,000. Objects : To carry on the business of electricians, manufacturers of, and dealers in, refrigerators, etc. Subscribers : K. McGovarin, 61, Ellison Road, Sidcup, Kent, and J. B. Dunnett, 50, Ivy Road, N.W.2, secretary. Solicitors : Garton & Co., 9, Cavendish Square, W.1.

Upminster Electrical Stores, Ltd.—Private company. Registered January 15th. Capital, £500. Objects : To carry on the business of radio, electrical and mechanical engineers, manufacturers of, and dealers in, electrical supplies, etc. Subscribers : I. C. Lewis, 2, St. Lawrence Road, Upminster and Geo. T. Andrews, 18, Grange Road, Grays, Essex. Solicitors : Canter, Hellyer & Co., 3-4, Lincoln's Inn Fields, W.C.2.

F. C. Wheatstone & Co., Ltd.—Private company. Registered January 22nd. Capital £500. Objects : To carry on the business of refrigerator manufacturers, electrical and general engineers, etc. Directors : F. C. Wheatstone and Elsie M. Wheatstone, both of 25, Hayburn Way, Romford, Essex, and R. C. Hall, 116, Tynemouth Drive, Enfield. Registered office : 25, Hayburn Way, Romford, Essex.

Sound & Scene Services (London), Ltd.—Private company. Registered January 7th. Capital, £2,000. Objects: To carry on the business of manufacturers of, and dealers in, apparatus for sound recording and reproducing sounds, images and signals by electrical, photographic or other means, etc. E. R. Mills, 37, Tongdean Avenue, Hove, 4, Sussex, is the first director. Registered office: 145, Wardour Street, London, W.1.

Elmbridge Instrument & Radio Co., Ltd.—Private company. Registered January 18th. Capital, £1,000. Objects: To carry on the business of manufacturers, repairers and hirers of, and dealers in, electrical and mechanical apparatus, accessories and components, radio sets and valves, gramophones, etc. Directors: F. W. Beaken, 156, Raeburn Avenue, Surbiton, and S. T. Barnes, 25, Raleigh Drive, Tolworth. Registered office: 21, Berrylands Road, Surbiton.

R. F. S. Howell & Co., Ltd.—Private company. Registered January 9th. Capital £10,000. Objects : To carry on the business of electricians, electrical and mechanical engineers, etc. Directors : R. F. S. Howell, The Laurels, Nelson Street, Stroud, Glos., and J. M. Thomas, Rodborough Manor, Rodborough, Stroud. Registered office : 8, Nelson Street, Stroud.

Visolite Ltd.—Private company. Registered January 15th. Capital £2,000. Objects : To carry on the business of manufacturers, fitters, repairers and factors of, and dealers in, cookers, fires, radiators, lamps, bulbs, wireless and television sets, electrical and other appliances and accessories, etc. Directors : W. O. Jackson, 54, Monks Avenue, New Barnet, Herts, and two others.

Rostronic, Ltd.—Private company. Registered January 15th. Capital, £100. Objects : To carry on the business of electricians, radio and electrical engineers, experts and contractors, and metal alloy makers, wire makers, repairers of engineering and electronic devices, etc. Subscribers : M. F. White and M. L. Coates, both of 69, Moorgate, E.C.2. Solicitors : Stone & Stone, 69, Moorgate, E.C.2.

Companies' Returns

Statements of Capital

Bath Electric Tramways, Ltd.—Capital £230,000 in £1 shares (75,000 preference, 125,000 preferred ordinary and 30,000 deferred ordinary). Return dated March 24th (filed November 5th). All shares taken up. £200,000 paid, £30,000 considered as paid. Mortgages and charges : Nil.

C. F. Casella & Co., Ltd.—Capital £17,000 in £1 shares (15,000 ordinary and 2,000 preference). Return dated November 7th. 12,204 ordinary and 2,000 preference shares taken up. £3,504 paid. £10,700 considered as paid. Mortgages and charges : Nil.

Falconar, Cross & Co., Ltd.—Capital £7,000 in 3,500 preference and 3,500 ordinary shares of £1 each. Return dated November 9th. 3,300 preference and 2,002 ordinary shares taken up. £2 paid. £5,300 considered as paid. Mortgages and charges: £4,042 15s. 1d.

John Adams, Ltd.—Capital, £7,000 in £1 shares (1,000 ordinary and 6,000 preference). Return dated November 3rd. 300 ordinary and 2,700 preference shares taken up. £3,000 paid. Mortgages and charges : Nil.

Cox-Cavendish Electrical Co., Ltd.—Capital £6,000 in £1 shares. Return dated December 4th. 4,344 shares taken up. £4,344 paid. Mortgages and charges: Nil.

Miller Bros. (Doncaster), Ltd.—Capital £500 in 500 shares of £1 each. Return dated December 14th. All shares taken up. £500 paid. Mortgages and charges: Nil.

Mortgages and Charges

Riley and Neate, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated January 12th, 1943, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Coventry Refrigerator Co., Ltd.—Satisfaction to the extent of £500 on October 9th, 1942, of debenture, registered April 15th, 1937.

Bankruptcies

D. G. Lee, electrician, 240B, Clapham Road, London, S.W.9.—Last day for receiving proofs for dividend February 10th. Trustee, Mr. H. H. Gaine, Bankruptcy Buildings, Carey Street, London, W.C.2, Official Receiver.

E. G. Williams, wireless and electrical dealer, 37, High Street, Brownhills, near Walsall.—Last day for receiving proofs for dividend February 12th. Trustee, Mr. R. K. Clark, 37, Temple Street, Birmingham, Official Receiver.

F. W. Hodges, electrical engineer, 9a, Station Hill, Kidderminster.—Last day for receiving proofs for dividend, February 13th. Trustee, Mr. K. V. Hooper, 1, Priory Street, Dudley, Official Receiver.

STOCKS AND SHARES

TUESDAY EVENING.

THE tendency of Stock Exchange markets as a whole remains very steady. The volume of business has fallen off since the middle of January, but this has had no effect upon the strength of prices. Last month saw a series of rises in the shares of electricity supply, electrical equipment, telephone and allied companies, with an increasing pressure on the part of prospective buyers to obtain shares that, in many cases, could not be supplied. With the Home Railway dividend season close at hand, rather more attention is being devoted to the market for the stocks without, however, influencing prices to any extent. Dividend estimates are serving to attract fresh attention to certain of the companies in the electrical equipment group.

Transport "C" Anomaly

London Passenger Transport "C" stock has come into line with Metropolitan Railway assented stock at about 60. This would seem somewhat anomalous, in that the Metropolitan stock receives interest at 3½ per cent. for fifteen years from July, 1933, and 3 per cent. for the following ten years : at the end of 1958, £100 Metropolitan assented stock will become £67 10s. London Passenger Transport "C" stock. The transfer might be effected earlier under certain conditions but in any case it would appear that Transport "C" should stand higher than Metropolitan assented. It may be argued that the Metropolitan stock is safe to receive 3½ per cent. dividend up to 1948 inclusive and 3 per cent. for the next decade, whereas the dividend on Transport "C" for this period is liable to fluctuation. For last year, a dividend of 2⅞ per cent. was paid on the latter. Market expectation looks for 3 per cent. in respect of last year.

Actions and Reactions

With last week's score of 50 rises, the present list of prices cannot quite catch up. The avaricious—or the super-optimist—must be content to observe that our quotations show about forty advances, which, after all, is by no means a bad performance, considering the gains secured by the prices in every January recital. Some of the more vivid of last week's rises have been partially surrendered. Transport "C" stock, for example, which put on 3½ points, is 10s. lower this week. Montreal Light & Power shares have reacted to 29. Enfield Cables came on offer, and the selling lowered the price by 1s. 6d. to 58s. Some of the "heavy" industries' shares have shed a few pence, Vickers, for instance, going back to 20s. and Babcocks to 50s. 6d. British Aluminium are 6d. down at 49s. 6d. The radio group is quieter. Prices are maintained at about their previous levels.

Manufacturing & Equipment

Aron Electrics have advanced 5s. to £2, and shares changed hands at a trifle above this figure. Westinghouse Brake attracted continued notice in consequence of the increased dividend. At 66s. 3d. the price is 3s. 9d. up. This found reflection in Consolidated Signals, which rose a similar amount to 5$\frac{5}{16}$, expansion in the next dividend being a foregone conclusion. Henley's, with a rise of 9d. to 25s. 6d. have approached the same plane of yield which British Insulated and Callender's occupy. S. Smith 1s. shares are up to 10s. Provincial inquiry for Ensign Lamps has raised the price to 18s. 9d. Switchgear & Cowans at 13s. 6d. are 1s. better, there being some idea that the dividend may be increased next month. Last year's 10 per cent. went against 15 per cent. in 1941. Lucas shares weakened to 68s. 9d. ; Tube Investments at 93s. have lost 6d. Siemens are a little better at 31s. Greenwood & Batley firmed up to 36s. 6d. Associated Electrical ordinary have risen to 50s. 6d. The electricity supply group presents no change of importance. North Eastern ordinary at 34s. are 1s. higher : the other alterations do not exceed 6d. Electric Constructions and English Electrics have further improved. Lancashire Dynamo shares are better at the round £4.

The New Scottish Board

The North of Scotland Hydro-Electric Board is a public corporation to be established for the purpose of generating electricity from water power, and for distributing and selling it. The Treasury has power to guarantee loans raised by the new issue, up to £30,000,000. In the Stock Exchange market, the project is considered unlikely to enter into competition with any of the existing electricity supply companies, but the scheme is regarded as a further step in the direction of nationalisation or socialism. It is frequently asked why the stocks of the Central Electricity Board are not given the status of trustee securities ? Presumably the proposed Scottish Board will issue loans in the same way as the Central Board has done, and developments are awaited with interest.

Whitehall Electric

Whitehall Electric 7½ per cent. preference shares have risen to 23s. on publication of a scheme whereby it is proposed to repay half the stock in cash and to reduce the dividend on the balance to 6 per cent. per annum. Shareholders are offered a cash payment of 1s. for each £1 of remaining preference stock held and £2 of ordinary stock in respect of

(*Continued on page* 198)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Feb. 2	Rise or Fall	Yield p.c. £	s.	d.
Home Electricity Companies							
Bournemouth and Poole	12½	12½	58/–	..	4	6	0
British Power and Light	6	6	29/6	+6d.	4	1	4
City of London	7	7	31/6	..	4	9	0
Clyde Valley	8	8	41/6	..	3	17	0
County of London	8	8	41/6	..	3	17	0
Edmundson's:							
7% Pref.	7	7	34/–	..	4	2	4
Ord.	6	6	29/–	..	4	2	9
Elec. Dis. Yorkshire	9	9	43/6	..	4	3	9
Elec. Fin. and Securities	12½	12½	49/–	..	5	2	1
Elec. Supply Corporation	10	10	46/6	..	4	6	0
Isle of Thanet	2	Nil	16/–	..		—	
Lancs. Light and Power	7½	7½	37/6	+6d.	4	0	0
Llanelly Elec.	5½	5½	22/6	..	4	17	9
Lond. Assoc. Electric	4½	4	24/–	..	3	6	8
London Electric	6	6	27/–	..	4	9	0
London Power Red. Deb.	5	5	104½	..	4	15	7
Metropolitan E.S.	8	8	41/–	..	3	18	0
Midland Counties	8	8	41/6	+6d.	3	17	0
Mid. Elec. Power	9	9	44/–	..	4	1	9
Newcastle Elec.	7	7	31/–	..	4	10	5
North Eastern Elec. Ordinary	7	7	34/–	+1/–	4	2	4
7% Pref.	7	7	34/6	..	4	1	2
Northampton	10	10	47/6	..	4	4	0
Notting Hill 6% Pref. (£10)	6	Nil	9¾	..		—	
Northmet Power: Ordinary	7	7	39/6	+6d.	3	11	0
6% Pref.	6	6	31/6	..	3	16	2
Richmond Elec.	6	6	27/–	..		—	
Scottish Power	8	8	41/–	..	3	18	0
Southern Areas	5	5	23/–	..	4	7	0
South London	7	7	26/–	..		—	
West Devon	5	5	22/6	..	4	9	0
West Glos.	4½	3½	21/6	..	3	5	2
Yorkshire Elec.	8	8	41/6	+6d.	3	17	0
Overseas Electricity Companies							
Atlas Elec.	Nil	Nil	5/–	..		—	
Calcutta Elec.	7*	7*	34/6	..		—	
Cawnpore Elec.	10	10	27/6	..	7	5	6
East African Power	7	7	31/–	+1/–	4	10	4
Jerusalem Elec.	7	5	23/6	..	4	5	0
Kalgoorlie (10/–)	7½	5	9/–	..	5	11	1
Madras Elec.	6*	4*	24/6	+1/–		—	
Montreal Power	1½	1½	29	–½	5	3	5
Palestine Elec. "A"	Nil	4*	31/–	..	2	11	8
Perak Hydro-elec.	6	7	9/6	..		—	
Shawinigan Power	83cts.	90cts.	20	+½		—	
Tokyo Elec. 6%	6	6	20½	..		—	
Victoria Falls Power	15	15	78/9	..	3	16	4
Whitehall Inv. Pref.	5	5	23/–	+3/–	4	7	0

Company	Dividend Previous	Dividend Last	Middle Price Feb. 2	Rise or Fall	Yield p.c. £	s.	d.
Public Boards							
Central Electricity: 1955-60 (Civil Defence)	—	3	100	..	3	0	0
1955–75	5	5	116	..	4	6	2
1951–73	4½	4½	108	..	4	3	4
1963–93	3½	3½	104	+1	3	7	3
1974–94	3¼	3¼	101	..	3	4	4
London Elec. Trans. Ltd.	2½	2½	96½	..	2	11	10
London & Home Counties 1955–75	4½	4½	110	..	4	1	10
Lond. Pass. Trans.: A	4½	4½	124½	..	3	12	4
B	5	5	122½	–1	4	1	8
C	3	2½	60	–½	4	15	40
West Midlands J.E.A. 1948–68	5	5	110	..	4	11	0
Telegraph and Telephone							
Anglo-Am. Tel.: Pref.	6	6	111½xd	+1	5	7	7
Def.	1½	1½	29xd	+1½	5	3	5
Anglo-Portuguese	8	8	25/6	+6d.	6	5	6
Cable & Wireless: 5½ Pref.	5½	5½	112½	+½	4	17	9
Ord.	4	4	78	..	5	2	7
Canadian Marconi $1	Nil	4cts.	7/9	+3d.	2	6	0
Globe Tel. & Tel.: Ord.	8½*	5*	32/6	..	3	1	6
Pref.	6	6	28/–	..	4	5	9
Great Northern Tel.: (£10)	Nil	Nil	23	..		—	
Inter. Tel. & Tel.	Nil	Nil	7	..		—	
Marconi-Marine	7½	7½	32/–	+6d.	4	13	9
Oriental Tel. Ord.	16	10	39/–	..		—	
Telephone Props.	6	Nil	13/9	..		—	
Tele. Rentals (5/–)	10	10	11/3	..	4	9	0
Traction and Transport							
Anglo Arg. Trans.: First Pref. (£5)	Nil	Nil	4/–	–1		—	
4% Inc.	Nil	Nil	13½	+½		—	
Brit. Elec. Traction: Def. Ord.	45	45	1100	..	4	1	9
Pref. Ord.	8	8	170	..	4	14	2
Bristol Trams	8	10	50/6	..	3	19	1
Brazil Traction	$½	$1	24½	+1		—	
Calcutta Trams	8	5½	20/–	+1/–	5	10	0
Cape Elec. Trams	5	5	22/6	..	4	9	0
Lancs Transport	10	10	43/3	..	4	12	4
Mexican Light: 1st Bonds	5	5	100	+1½	5	0	0
Rio 5% Bonds	5	5	103½	..	4	16	6
Southern Rly.: 5% Prefd.	5	5	78	+½	6	8	2
5% Pref.	5	5	117½	..	4	5	1
T. Tilling	10	10	53/9	+1/–	3	14	4
West Riding	10	10	40/–	+6d.	5	0	0

(*Continued on next page*)

*Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Feb. 2	Rise or Fall	Yield p.c. £	s.	d.
Equipment and Manufacturing							
Aron Elec. Ord. ..	7½	10	40/–	+5/–	5	0	0
Assoc. Elec. :							
Ord.	10	10	50/6	+1/–	3	19	0
Pref.	8	8	39/–	..	4	2	0
AutomaticTel.&El.	12½	12½	55/6	..	4	10	0
Babcock & Wilcox	11	11	50/6	−9d.	4	7	2
British Aluminium	10	10	49/6	−6d.	4	1	0
British Insul. Ord.	20	20	5⅞	..	3	17	3
British Thermostat (5/–)	18½	18½	17/6	..	5	5	9
British Vac. Cleaner (5/–)	10	15	21/6	..	3	9	9
Brush Ord. (5/–)	Nil	6	7/9	+6d.	3	17	5
Callender's ..	15	15	78/9	..	3	16	0
ChlorideElec.Storage	15	15	76/3	..	3	18	9
Cole, E. K. (5/–)	7	10	21/3	..	2	7	0
Consolidated Signal	17	17	106/3	+3/9	3	4	5
Crabtree (10/–) ..	17½	17½	38/6	..	4	11	0
Crompton Parkinson Ord. (5/–) ..	30	20	26/–	..	3	17	0
E.M.I. (10/–) ..	6	6	21/6	..	2	15	9
Elec. Construction	10	10	42/6	+⅛	4	14	1
Enfield Cable Ord.	12½	12½	58/–	−1/6	4	6	0
Elecl. Switchgear (10/–)	10	10	20/–	..	5	0	0
English Electric ..	10	10	49/6	+1/–	4	1	0
Ensign Lamps(5/–)	25	25	18/9	+⅛	6	13	4
Ericsson Tel. (5/–)	22*	20*	47/6	+⅛	2	2	2
Ever Ready (5/–)	40	40	39/–	..	5	2	7
Falk Stadelmann	7½	7½	26/–	..	5	15	5
Ferranti Pref. ..	7	7	28/9	..	4	17	5
G.E.C. :							
Pref.	6⅛	6⅛	33/3	..	3	18	4
Ord.	20	17½	87/–	+6d.	4	0	8
Greenwood & Batley	15	15	36/6	+6d.	8	4	4
HallTelephone(10/–)	10	12½	23/9	..	5	5	5
Henley's (5/–) ..	20	20	25/6	+9d.	3	18	0
4½% Pref. ..	4½	4½	23/–	..	3	18	3
Hopkinsons ..	15	15	57/–	..	5	5	3
India Rubber Pref.	5½	5½	20/–	..	5	10	0
Intl. Combustion	32½	30	6	..	5	0	0
Johnson & Phillips	15	15	63/6	..	4	14	4
Lancashire Dynamo	20	20	4	+⅛	5	0	0
Laurence,Scott(5/–)	15	12½	10/–	..	6	5	0
London Elec. Wire	7½	7½	30/–	..	5	0	0
Lucas, J.	15	15	68/9	−¼	4	7	3
Mather & Platt ..	10	10	48/3	..	4	3	2
Met.Elec.CablePref.	5½	5½	21/3	..	5	3	6
Murex	20	20	5⅛	..	3	15	0
Pye Deferred (5/–)	25	25	21/3	..	5	17	8
Revo (10/–) ..	20	17½	35/6	..	4	18	7
Reyrolle	12½	12½	64/6	..	3	17	6
Siemens Ord. ..	7½	7½	31/–	+6d.	4	16	9
Smith, S. (1/–) ..	50	37½	10/–	+⅛	3	15	0
Strand Elec. (5/–)	4	7½	6/3	+6d.	6	0	0
Switchgear & Cowans (5/–) ..	15	10	13/6	+1/–	3	14	1
T.C.C. (10/–) ..	5	5	15/–	..	3	6	8
T.C. & M... ..	10	10	48/–	+6d.	4	3	4
Telephone Mfg.(5/–)	9	9	11/6	..	3	18	2
Thorn Elec. (5/–)	20	20	19/–	..	5	5	2
Tube Investments	23¾	20	93/–	−6d.	4	6	0
Vactric (5/–) ..	Nil	Nil	11/6	+1/6	—		
Vickers (10/–) ..	10	10	20/–	−3d.	5	0	0
Ward & Goldstone (5/–)	20	20	22/–	..	4	11	0
Westinghouse Brake	10	12½	66/3	+⅜	3	15	6
WalsallConduits(4/–)	55	55	42/6	..	5	3	6
West, Allen (5/–)	7½	7½	6/6	..	5	15	5

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 196)

every £5 of remaining preference stock. The scheme is considered to foreshadow a payment of dividend on the ordinary stock. The reduction of dividend on the existing 7½ per cent. preference shares should be compensated by a distribution on the ordinary, and when a market becomes established in the new ordinary stock, to-day's holders of the 7½ per cent. preference shares will probably find themselves better off than they are at the present time with the existing shares standing at 23s. The scheme disregards the Athens interest of the company. This, incidentally, is a reminder of the fall in the price of Whitehall Electric shares to about 10s. when Greece was overrun by the Germans.

General Electric

The price of General Electric ordinary shares was not affected by the death of the chairman, Lord Hirst. The news was received with regret by many people in the Stock Exchange, and in the City, who knew Lord Hirst personally. Memory recalls the days when, some fifteen years ago, General Electric Company shares were being bought by tens of thousands at a time for American interests. So great was the emigration of G.E.C. shares from this country to the United States that the company projected making a new issue of 1½ million ordinary shares which it was proposed should be issued to British nationals exclusively. As a matter of fact, the issue was withdrawn under somewhat dramatic circumstances. The company took steps to ensure that its control should remain in the hands of British holders. As things turned out, the Americans sold most of their shares back to this country at prices well under those at which they made their purchases in the first place. The files of the *Electrical Review* record the excitement which prevailed at that time in connection with the proposed issue that was withdrawn literally at the last moment. Nowadays, the General Electric is recognised as being one of our front rank industrial companies and the modesty of the yield on the shares, which at 86s. 6d. is little more than 4 per cent. on the money, witnesses to the respect with which the shares are regarded by investors.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2. The superseded application numbers are omitted except where specifications have been advertised in the Journal under those numbers as open to public inspection under Sec. 91 (4) *of the Patents Acts.*

ACES Development Co., Ltd., and E. R. Friedlaender. — "Powdered magnetic cores." October 16th, 1941. (550577.)

Babcock & Wilcox, Ltd., and R. J. Glinn.—"Fluid-heater cleaners." July 10th, 1941. (Addition to 532692.) (550536.)

J. R. Bateman.—"Control of electric spot welders." May 11th, 1942. (550615.)

F. J. G. Van Den Bosch, and Vacuum-Science Products, Ltd.—"Electron multipliers." May 7th, 1941. (550586.)

British Thomson-Houston Co., Ltd.—"Automatic control of current transmission through electric valve apparatus." 11031/41. August 31st, 1940. (550509.) "Gettering arrangements for highly evacuated envelopes of electron discharge tubes." 11490/41. September 9th, 1940. (550551.) "Stroboscopes." 1219/42. January 30th, 1941. (550608.) "Coffee infusers." 1572/42. February 7th, 1941. (550632.)

British Thomson-Houston Co., Ltd., and H. K. Bourne.—"Electric discharge lamps." October 25th, 1941. (550581.)

C. T. Drummond.—"Electric switches operated by a rotatable part." September 4th, 1941. (550547.) "Electrically driven clocks." September 4th, 1941. (550548/9.) "Clocks." September 4th, 1941. (550550.)

Dubilier Condenser Co. (1925), Ltd.—"Method of applying metallic coatings to insulating sheets." 13666/42. June 15th, 1940. (550617.)

Dubilier Condenser Co. (1925), Ltd., and J. H. Cotton.—"Electrolytic condensers." July 10th, 1941. (550535.)

Edison Swan Electric Co., Ltd., and F. M. Cocksedge.—"Means for suspending pendant fittings." September 4th, 1941. (550625.)

Electric Construction Co., Ltd., and E. Gledhill.—"Control of direct current electric motors." June 11th, 1941. (550527.)

Electrolux, Ltd. (Aktiebolaget Elektrolux).—"Dish-washing machines." September 22nd, 1941. (550511.)

English Electric Co., Ltd., and H. S. Carnegie.—"Power transmission by dynamo-electric machines." June 11th, 1941. (550590.)

Finch Telecommunications, Inc.—"Facsimile scanning system." 10401/41. August 16th, 1940. (550570.)

F. H. Foster, and Butterley Co., Ltd.—"Refrigerating systems." September 25th, 1941. (550512.)

J. D. Gilbert, and Ferguson Battery Co., Ltd.—"Manufacture of galvanic batteries." October 16th, 1941. (550628.)

Igranic Electric Co., Ltd., and C. E. Randall.—"Electric relays for use with alternating current of variable frequency and voltage." March 25th, 1942. (550611.)

Marconi's Wireless Telegraph Co., Ltd.—"Antenna systems." 8755/41. July 10th, 1940. (550537.) "Frequency modulation." 12464/41. September 26th, 1940. (550554.)

Marconi's Wireless Telegraph Co., Ltd., C. S. Cockerell, and J. H. Moon.—"Radio bearing indicators and control means." June 9th, 1941. (550619.)

Marconi's Wireless Telegraph Co., Ltd., and T. D. Parkin.—"Quenched electric oscillation generators." June 13th, 1941. (550591.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—"Devices for use in checking the equality of two frequencies." January 9th, 1942. (550607.) "Devices for measuring small direct voltages." February 6th, 1942. (550610.) "Optical systems." July 9th, 1941. (550643.) "Optical elements." July 9th, 1941. (550644/5.)

A. Phillips, and Metropolitan-Vickers Electrical Co., Ltd.—"Manufacture of cast iron." July 26th, 1941. (550542.)

Plessey Co., Ltd.—"Push-button switches." 4855/42. May 6th, 1941. (550518.)

T. W. Ross, N. Ryder, and Metropolitan-Vickers Electrical Co., Ltd.—"Shaded photo-electric devices, more particularly for exposure meters." December 9th, 1941. (550631.)

Sangamo Weston, Ltd. (Weston Electrical Instrument Corporation).—"Circuits including instrument type relays." September 18th, 1941. (550552.)

Standard Telephones & Cables, Ltd.—"Radio course indicators." 2590/42. March 1st, 1941. (550633.)

Standard Telephones & Cables, Ltd., and C. W. Earp.—"Automatic frequency control." July 11th, 1941. (550566.) "Automatic frequency control of radio receivers." July 11th, 1941. (550567.)

Standard Telephones & Cables, Ltd., and J. Handley.—"Electric measuring instruments." July 7th, 1941. (550648/9.)

Standard Telephones & Cables, Ltd., and E. C. Lee.—"Joints and terminations for electric power cables." July 8th, 1941. (550503.)

J. W. Young, and Metropolitan-Vickers Electrical Co., Ltd.—"Control of electric power stations." December 19th, 1941. (550583.)

Passing On British Experience

IT is reported in *Electrical West* that the Federal Power Commission has been designated as the official Government co-ordinating agency for the dissemination in the United States of information obtained from the Electricity Commission in England on wartime utility operation. This action is stated to have been taken following a British request for a channel through which to send information and also for the appointment of a U.S. Government agency to determine the standing of American concerns asking for British data.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia. — NEW SOUTH WALES. — Sydney County Council. March 25th. 22-kV metal-clad neutral switching equipment (Spec. 610).

June 24th. Steam generating plant for Pyrmont power station, section B. (Spec. 650).

July 8th. 50,000-kW steam turbo-alternator set for Pyrmont (Spec. 651).

VICTORIA. — State Electricity Commission. March 3rd. 132- and 66-kV outdoor switchgear and accessories (Spec. 42-43/42).

April 14th. Compound-filled 22-kV switchgear with all accessories (Spec. 42-43/41).

Belfast.—February 24th. Electricity Department. Stores, including electrical material. (See this issue.)

Birkenhead. — February 15th. Electricity Department. Electric lamps. (January 29th.)

Liverpool.—February 8th. Electric Supply Department. Six 250-kVA transformers. (January 29th.)

Tottenham.—February 12th. Borough Council. Electric lamps (Schedule No. 20). Forms of tender on application to E. Townson, town clerk, Town Hall.

Orders Placed

Southgate. — Finance Committee. Recommended. Public address equipment (£147)—Standard Electrical Engineering Co.

Stretford.—Town Council. Recommended. Refrigerating plant at the Victoria Restaurant.—G.E.C.

Surbiton.—Town Council. Accepted. Laying of cable and the electrification of the sewage works (£2,930).—Ellis & Ward.

Swinton and Pendlebury.—Town Council. Accepted. Apparatus for oil purification plant at the electricity works.—Metafiltration, Ltd. (Birmingham).

Tynemouth.—Transport Committee. Accepted. Trix sound equipment (£49).—Sun Electrical Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Airdrie.—Proposed completion of houses; burgh surveyor, Royal Buildings, Graham Street.

Barnsley.—Extensions to premises; Beckett Hospital Trustees.

Brighouse.—Canteen at Woodvale Mills; Mellor, Ltd., mustard manufacturers, Oxford Street.

Additions to Sunny Vale Firebricks Works; Allen & Sons (Halifax), Ltd., brickmakers, Halifax.

Droitwich.—Houses; R. E. Hulse, borough surveyor, Town Hall.

Durham.—Repairs to electrical installation at Sherburn Hill Infants' School for the C.C.; county architect, 34, Old Elvet, Durham.

Fallowfield.—Office for works, Langley Road, Mabfield Road and Wilmslow Road; E. L. Doyle, architect, 26, Hollins Lane, Marple Bridge, Cheshire.

Harrow.—Additional accommodation at Elmgrove Road and Donnefield Avenue depots (£1,015) and erection of nursery, site in Rayners Lane area; H. W. Rackham, surveyor, Council Offices, Uxbridge Road, Stanmore.

Hinckley.—Wards and nurses' home; F. B. Smith, secretary, Hinckley and District Hospital, Mount Road.

Kilmarnock.—Welding and fitting shop for Barr, Thomson & Co., Ltd., Netherton Ironworks (£4,500); manager.

London.—Reinstatement of schools (£10,000); L.C.C. architect.

Macclesfield.—Alterations to the General Infirmary, for X-ray apparatus (£3,300); secretary, Macclesfield General Infirmary.

Malton.—Augmentation of water pumping plant (£1,500); surveyor, R.D.C. Offices.

Manchester.—Boiler house at works; Moston Brick & Building Co., Ltd., builders, Kenyon Lane, Moston.

Middlesbrough.—Temporary rebuilding of the Leeds Hotel for North-Eastern Breweries, and warehouse in North Road, for Phillips, Son & Co., Ltd.; Kitching & Co., architects, 21, Albert Road.

Newcastle-on-Tyne.—Additional storey to premises of R. H. Patterson & Co., Ltd.; C. Graham, 17, Middleton Avenue.

Kitchens, etc., at schools (£30,500); education architect, Northumberland Road, Newcastle.

Oxfordshire.—R.C. school, Littlemore; county architect, 3, Becket Street, Oxford.

Paisley.—Additions and alterations at works for Fleming & Ferguson, Ltd., engineers and shipbuilders, Phœnix Works, Inchinnan Road; manager.

Shropshire.—Buildings for Council of Youth (£2,500); A. G. Chant, county architect, 5, Belmont, Shrewsbury.

Sunderland.—Erection of semi-permanent school premises in Valley Road (£15,400); direct labour by the Education Works Department.

Tiverton.—Additions, Westexe Garage, Westexe North; J. Heathcoat & Co.

Whaley Bridge.—Houses; W. Butler, surveyor, Council Offices, Market Street, Whaley Bridge.